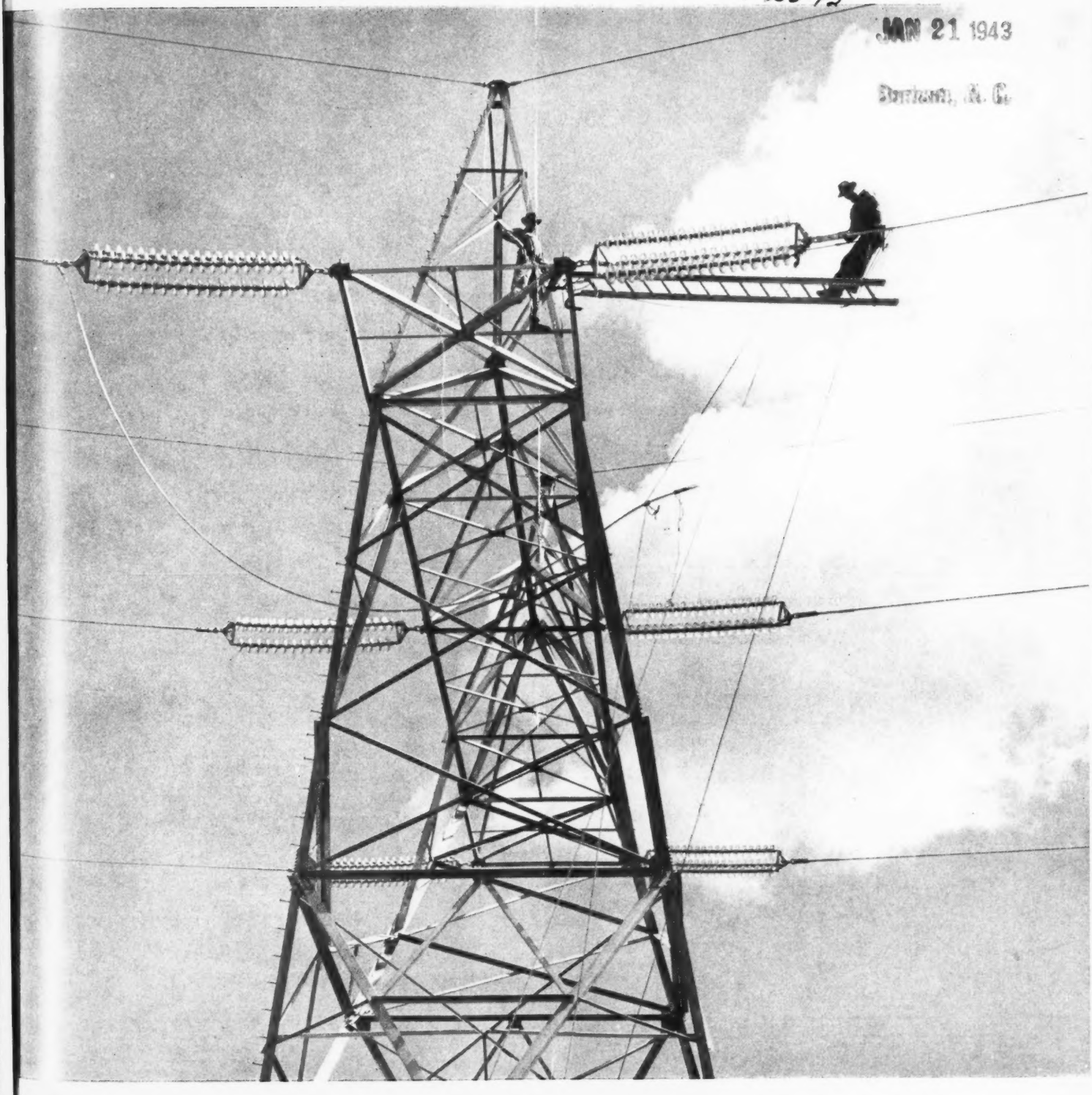
ELECTRICAL WEST

THE ALL-INDUSTRY MAGAZINE OF PROGRESS

1-26-43

JAN 21 1943

Portland, N. C.



McGraw-Hill Co.

JANUARY 1943

25c a Copy

A NEW YEAR OF COURAGE

Behind us lie the solved problems and the conquered difficulties of one of the most trying years our nation has ever known. Ahead are more hard situations—but our country, trusting in God's goodness and guidance and strengthened by the struggles of 1942, faces the New Year with confidence.

We know we can meet unflinchingly the demands and sacrifices of war. We are working harder than we have ever worked before . . . we are doing without many of the privileges to which we have been accustomed—and doing it all with heads held high with pride that we are free men and women of a nation that is worthy of our every sacrifice.

We say—"Come ahead, 1943. Whatever you may bring, we are ready."

Harris J. Baum

PRESIDENT

SOUTHERN CALIFORNIA EDISON COMPANY LTD.

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Ask for these

Helpful PUBLICATIONS on G-E BUSHINGS

They'll Enable You to Reduce the Number of Spares You Need

New Information to Help You

SAVE TIME and CRITICAL MATERIALS

You can easily determine:

—the application possibilities of the spare bushings you may have on hand.

—interchangeability between your old and new bushings.

—the extent of interchangeability between bushings used on apparatus of different classes.

—which new bushings to select when replacing damaged or superseded types.

—whether it is feasible to repair defective bushings, or whether they should be replaced.

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in six plants manufacturing naval equipment.

GENERAL ELECTRIC

A and **B** include application information on practically all General Electric Types OF (oil-filled) and L (liquid-filled) bushings—also superseded Types CF (compound-filled) and S (rigid-core) bushings—that have been manufactured since 1916. Catalog Numbers of both old and new bushings are listed in easy-to-use tabular form to give you complete information on bushing interchangeability.

C and **D** contain data—including descriptive information, weights, dimensions, and electrical data—on Types OF and L bushings of modern design, and are invaluable companion pieces to application bulletins **A** and **B**.

FREE

General Electric Company, Section C 401-9
Schenectady, N. Y.

Yes, I am very much interested in your time-saving publications on G-E bushings. Please send me copies as indicated.

A GET-907 ..... copies
B GET-906 ..... copies
C GEA-2514 ..... copies
D GEA-2513A ..... copies

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Company .....

Address .....

City ..... State .....

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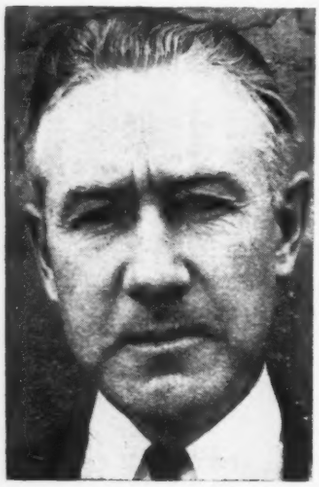
Here in the WEST

People

E. G. Stahl
who writes of selling a farmer smaller motors to pump more water at better load factor (p. 56) is a farmer by birth (See Electrical West, May 1942, p. 65) who grew to become sales manager of San Joaquin Power Div., of PG and E Co. at Fresno.



T. J. Welsh
was born in Anaconda, educated at University of Nevada and has been in the engineering department of Sierra Pacific Power Co. at Reno for 21 years where he is now assistant engineer. Besides electric design he does hydraulic too, and combined the two in the fish screen (p. 37) he tells about.

Lester Siebert
graduated from the world's biggest university, that of Hard Knox, went to work in the electrical industry in 1905 in San Francisco. In

1906 after the "fire" he worked for Al Drendell, contractor, who started building switchboards and expanded into manufacturing. In 1920 Siebert and Julius Gensler bought the company, operating it as Drendell Electric Mfg. Co. until 1930 when it was bought by Trumbull and Siebert was retained as manager. In this issue (p. 44) the second half of his paper on busways and bus distribution for wartime industries appears. The first half ran in the December number, P. 64-65. Siebert is a golfer, amateur camera fan, world traveler when the world is open to travel, and industry cooperator.

Pages

It's Hard to Say "No" 31
How Pacific Gas and Electric prepares public contact employees to meet negative impacts of the war situation.

Electric Fish Screen Saves Steel 37
By T. J. WELSH—Sierra Pacific Power Co. saved metal, cut costs with new installation.

Prefabricated Wiring for Prefabricated Houses 42
Erection of 4,000 houses in Utah shows what shop assembly can do for housing.

Utilization for Pumping Load 56
By E. G. STAHL—Engineering customer equipment is important factor in farm production utility revenue.

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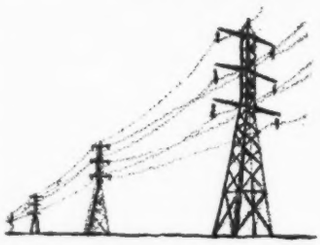
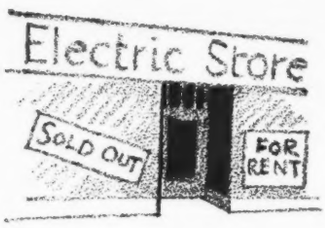
Cover photo: Construction of a transmission tower to carry Grand Coulee power. Photo courtesy U. S. Bureau of Reclamation.

Preview

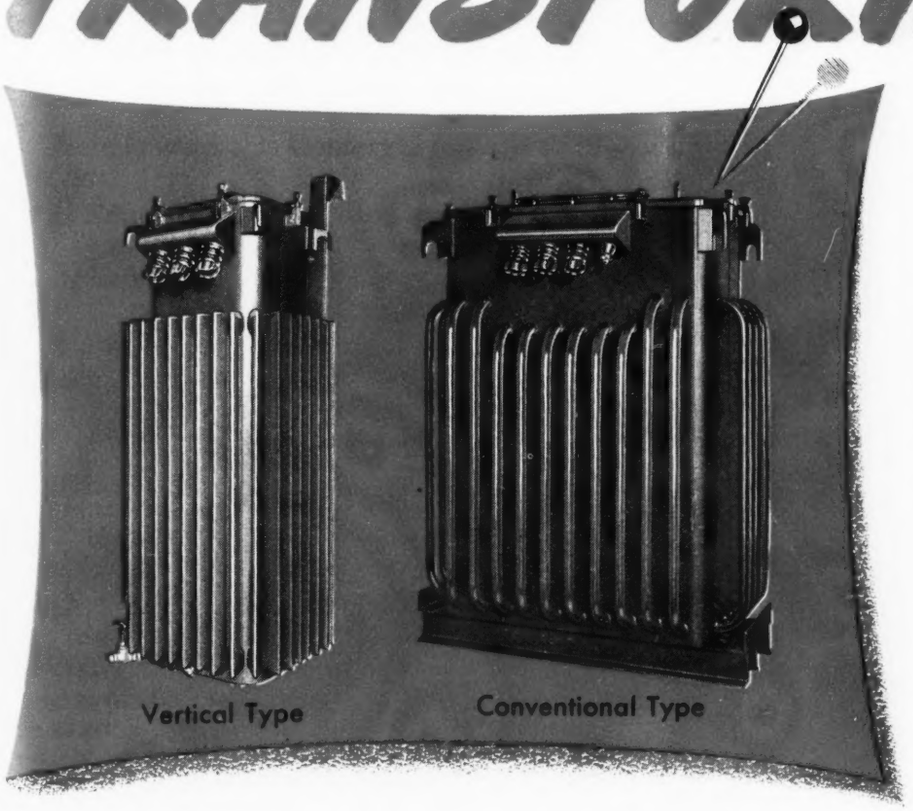


Annual Roundup
of data concerning the electrical industry in the 11 Western states during the year of 1942 and predictions for 1943 will be published in the February ELECTRICAL WEST—at least all of it that is not military information and thus restricted. The past year was a peculiar one in so many unexpected ways that electrical people will be curious to review just how it went. As to 1943 the best opinions of the best informed will be presented here for the guidance of the industry. Generating capacity, transmission lines added in 1942 or contemplated in 1943 will be listed.



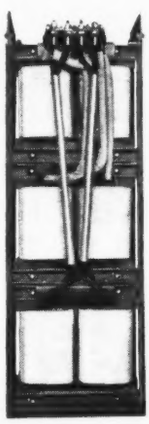
"No Sale"
is rung up on the cash register for the duration but it will be interesting to learn to what extent dealers have survived, what they are doing to keep going, what the final roundup of sales was for the past year and what the future outlook is for the entire commercial side of the electrical business. The Annual Statistical Review number will be a more than ordinarily interesting issue this year.

NOW! a complete new line of L-M THREE PHASE TRANSFORMERS



"They're the biggest transformer news since the birth of the Round-Wound!" declare engineers who have carefully pre-viewed the new L-M Three Phase Transformers.

Every unit in the complete line measures up to the L-M tradition of giving you more for your transformer dollar because every one of them is sound in the fundamentals ...of design, materials, workmanship. That is why, wherever the most efficient and economical operation of your distribution system calls for a three-phase transformer, it will pay you well to install an *L-M* Three Phase Transformer.



VERTICAL TYPE

L-M Three Phase Transformers save space, eliminate platform constructions, give you trim, neat, on-the-pole installations. You will find these L-M Vertical types in ratings up to 150 Kv-a, and up to 13,200 volts. *Ratings up to and including 75 Kv-a have L-M Round-Wound core and coil assemblies.*

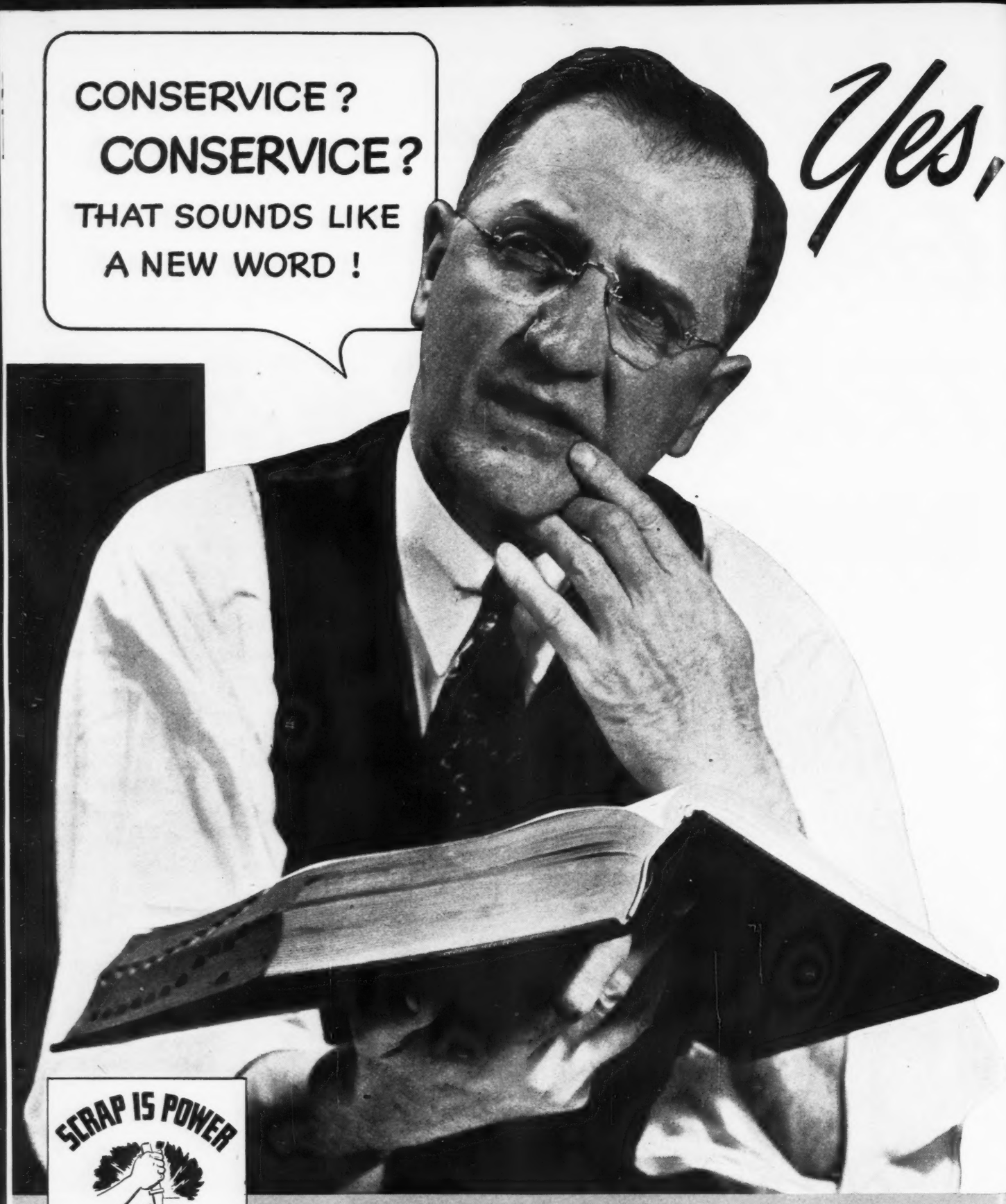
CONVENTIONAL TYPE

L-M Three Phase Transformers in sizes 100 to 500 Kv-a are generously designed throughout, insure rugged, punishment-taking stamina. Round coils, free from right angle bends, assure greater mechanical and impulse strength, damage-free insulation and long service life.

GET FULL INFORMATION

Before you invest in another three-phase transformer be sure to get the full, interesting story about the complete line of L-M Vertical Type and Conventional Type Three Phase Transformers. The new *L-M Three Phase Bulletin*, No. 43161 is ready. Ask your L-M representative, or write Line Material Co., 802 N. 8th St. Milwaukee, Wis., for a free copy.

LINE MATERIAL COMPANY



Yes,

SCRAP IS POWER

you help.. THE WAR EFFORT
.. YOUR CUSTOMERS AND YOURSELF
... when you salvage, in accordance with your manufacturer's instructions, all inoperative parts containing...

CRITICAL MATERIALS

Cooperate with Your Industry!
Put Vitally Needed Scrap Back Into The Scrap
today!

Westinghouse

"CONSERVICE" IS A NEW WORD!

It sums up the broadened conservation and service program now being operated by Westinghouse and its retailers

Conservation . . . Service . . . these two critical words have been telescoped into *Conservice*—a new term for a new kind of helpfulness to appliance users.

Here is what this Conservice program is designed to do:

1. Educate your customers in the proper "care and use" and thus—
   . . lengthen the life of appliances
   . . prevent needless service calls
2. Promote conservation of renewal parts—
   . . by showing your servicemen how to repair old parts
   . . by reoperating at the factory the used parts which you return, thus conserving critical materials
3. Help you provide quality service—
   . . by informing and training your servicemen
   . . by providing renewal parts

In order that your entire service department, especially the newcomers, shall be primed on every phase of this new Conservice program, Westinghouse is launching a series of Conservice Training Schools. Both in scope and character, we believe they will go far beyond anything ever before offered by a manufacturer of electric appliances.

While doing everything in our power to keep a steady supply of renewal parts flowing to you, we are at the same time giving you the kind of practical assistance that will help you solve your man power and service problems.

WESTINGHOUSE ELECTRIC APPLIANCE DIVISION
MANSFIELD, OHIO

Coming your way!

A COMPLETELY EQUIPPED CONSERVICE TRAINING SCHOOL

Hundreds to be conducted during 1943

Here's a course of instruction made to order for the times. One part of it is planned especially for the newer men and women who will be servicing appliances during the coming months.

With dramatic films, illustrated manuals, simple discussions and demonstrations, the service person receives training completely covering the servicing of Westinghouse appliances and the conservation of renewal parts.

Your Westinghouse distributor will notify you as soon as the date is set for the Conservice Training School in your territory.

Copyright 1943,
Westinghouse Electric & Mfg. Co.

Tune in John Charles Thomas, Westinghouse Radio Program, NBC, Sunday 2:30 P.M., Eastern War Time

WESTINGHOUSE

Electric Home Appliances

SIMPLEX...

Insulated Wires and Cables must conform to war-time regulations now and "for the duration" but they retain the properties necessary for satisfactory service.

Into them we are putting the accumulated "know-how" of nearly sixty years devoted exclusively to making wires and cables with rubber, varnished cambric, impregnated paper and plastic insulations.

Shortages of many of the materials normally used in insulated wires and cables have seriously upset production schedules but expert use of what is available is breaking production bottlenecks caused by restrictions designed to conserve and control "critical materials."

The background of knowledge and skill built up during more than a half century now enables us to make the most of the limited materials we can get.

If you are doing essential, high priority war work and must have new cables we shall be glad to tell you more about Simplex cables and what they can do for you.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

ARMY E NAVY

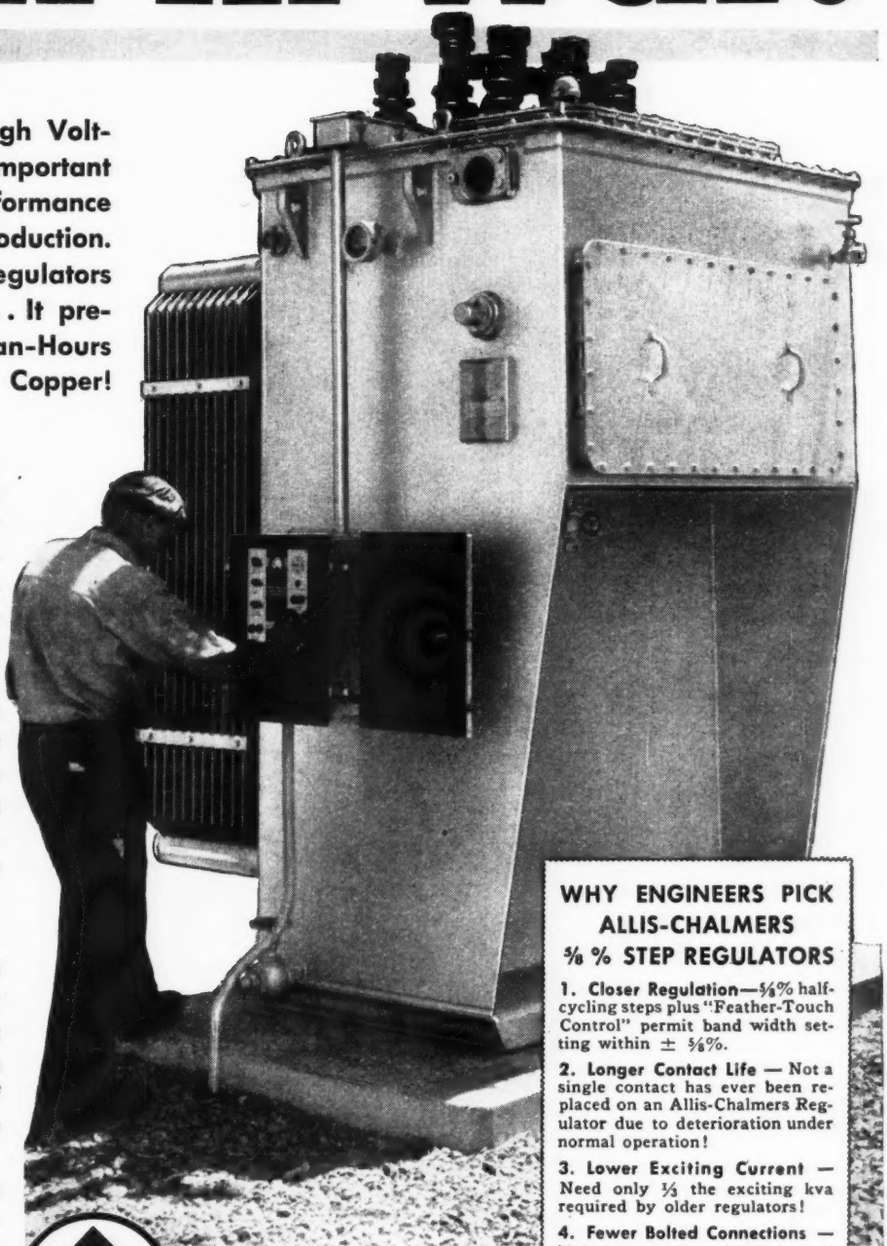
Simplex

WIRES and CABLES

GOOD BUSINESS IN PEACETIME . . .

Vital in War!

Maintaining uniformly High Voltages becomes even More Important now that Peak Motor Performance is essential to our War Production. Doing it with 5/8% Step Regulators not only Saves Money . . . It prevents Waste of both Man-Hours and huge Quantities of Copper!



GOOD BUSINESS in peacetime, vital in war! That's what far-seeing system planners say about feeder voltage regulation.

In normal times power companies installed regulators to provide superior service economically.

That's even more important today. Maintaining uniformly high voltages means that motors in vital war plants give peak performance round the clock.

And today there's a *new* factor to consider: *copper!*

Stop This Copper Waste!

It takes important copper and man-hours to rebuild a feeder (or install a new one) to boost faltering voltage. By using a regulator instead, *thousands of pounds of copper and many man-hours can be saved!*

For complete information on how you can give better service and still save vital material, call the district office near you. Or write for our new bulletin B6056A. ALLIS-CHALMERS, MILWAUKEE, WIS. A-1575

WHY ENGINEERS PICK ALLIS-CHALMERS 5/8 % STEP REGULATORS

1. **Closer Regulation**—5/8% half-cycling steps plus "Feather-Touch Control" permit band width setting within ± 5/8%.
2. **Longer Contact Life** — Not a single contact has ever been replaced on an Allis-Chalmers Regulator due to deterioration under normal operation!
3. **Lower Exciting Current** — Need only 1/3 the exciting kva required by older regulators!
4. **Fewer Bolted Connections** — Unit construction eliminates 78 bolted connections between compartments.
5. **Minimum Maintenance** —No holding or braking devices. Oil-immersion of all moving parts eliminates lubrication.

WE WORK FOR VICTORY — WE PLAN FOR PEACE

ALLIS-CHALMERS 5/8% STEP REGULATORS

This is a composite photograph of many members of the "Bomber Building" army who individually helped save 100,000 man-hours or more in America's war factories.

Here's the Latest News about the "BOMBER BUILDERS"

HELPING with all their might to speed war production through better lighting, 2907 lighting men in all parts of the country have signed the pledge reproduced on the opposite page. Every day this army grows stronger as new names are added.

Already these 2907 men, recruited from the staffs of electric service companies, electrical jobbers, contractors and manufacturers of lighting equipment, as well as from General Electric's own lighting experts, are credited with adding over 21 million man-hours annually to America's war production.

Each of these men, known as "Bomber Builders", received a Silver Bomber lapel button upon signing the pledge. And each of them has as his goal the winning of the Gold Bomber pin, which is awarded to every man who "builds a bomber", that is, every man who helps save 100,000 man-hours in war factories through lighting improvements. As of December 7, a total of 139 "Bomber Builders" had won the right to wear the Gold Bomber pin. And many others are well on their way toward that goal.

The lighting industry has a right to be proud of these men—all of them. General Electric is glad to publish this tribute to these Wartime Lighting Counsellors who have pledged their time and effort toward one goal —"using light to help win the war."

G-E MAZDA LAMPS

HERE'S THE HONOR ROLL OF "BOMBER BUILDERS"...DECEMBER 7, 1942

EACH OF THESE MEN HAS HELPED SAVE OVER 100,000 MAN-HOURS OR MORE:

JOHN R. ALLEN, Electro Manufacturing, Chicago
J. M. ASHER, Benjamin Electric Manufacturing, Philadelphia
WM. J. ASHTON, Pacific Div., G-E
H. ATKINSON, Graybar Electric, Houston
F. K. BAILEY, Muntz & Lea, Chicago
R. H. BAKER, Mill Power Supply, Charlotte, N. C.
A. G. BIRD, Graybar Electric, Lansing
L. J. BISCHOF, Atlantic Division, G-E
J. G. BLOOD, G. E. Supply, Buffalo
E. G. BRADLEY, Madison Electric, Detroit
LYN BRIGHT, Elliott-Lewis Electric, Philadelphia
J. W. BROWN, Atlantic Division, G-E
E. A. BUEL, Continental Division, G-E
JOHN T. BURDICK, Madison Electric, Detroit
J. A. BUREL, Matthews Electric Supply, Birmingham
W. WALLACE BURKE, Public Service Co. of N. H., Manchester
R. P. BUSCH, Empire Division, G-E
L. J. CAMPBELL, Southeastern Div., G-E
JOHN R. CANNING, Elliott-Lewis Electric, Philadelphia
J. W. CARPENTER, Elliott-Lewis Electric Philadelphia
T. G. CARROLL, Wakefield Brass, Detroit
R. B. CHIPMAN, JR., Continental Division, G-E
I. E. CHRISTMAN, Alleghany Div., G-E
C. A. CLAYTON, J. M. Clayton Co., Atlanta
G. A. CLOSE, Wheeler Reflector Co., New York City
HARRY B. COAX, Empire Div., G-E
E. E. COLEMAN, Midwest Div., G-E
W. COLEMAN, Madison Electric, Detroit
OLCOTT N. COLLAR, Commonwealth Edison, Chicago
J. R. COLVILLE, JR., Atlantic Division, G-E
H. W. CONKLIN, Continental Div., G-E
RAYMOND W. CORWIN, Benjamin Electric Mfg., Philadelphia
J. M. COSTELLO, Atlantic Div., G-E
R. W. COULS, Madison Electric, Detroit
H. G. CRAFT, Mill Power Supply Charlotte, N. C.
C. L. CROUCH, Buffalo Niagara Electric, Buffalo
GENE D'ANGELO, Philadelphia Electric, Philadelphia
ROBERT D. DAVEY, Consumers Power, Adrian, Mich.
A. W. DAVIS, Continental Div., G-E
GOMER F. DAVIS, Buckeye Div., G-E
C. J. DETMERS, Madison Electric, Detroit
E. F. DIBELIUS, Atlantic Division, G-E
GEO. E. DYGERT, Madison Electric, Detroit
T. C. ERRINGER Northern Division, G-E
FRANK C. FLETCHER, Graybar Electric, Minneapolis
W. R. FLOUNDERS, Continental Division, G-E
C. K. FULLERTON, Madison Electric, Detroit
E. E. FOURNIER, G. E. Supply, Springfield, Mass.
HENRY GALLIEN, JR., New York Power & Light, Troy, N. Y.
R. D. GLENNIE, G. E. Supply Corp., Buffalo
E. G. GOLDSMITH, Empire Div., G-E
M. W. GORDON, New York Power & Light, Troy, N. Y.
K. A. GOTTSCHALK, Cleveland Electric Illuminating Co., Cleveland
L. M. GRAWEMEYER, The Miller Co., Ardmore, Pa.
H. R. GREENE, Daybrite Ltg. Inc., Cleveland
G. L. GRUENWALD G. E. Supply, Wichita, Kansas
DUPONT GUERRY, Huntington & Guerry, Greenville, S. C.
JAMES E. HAMILL, Atlantic Div., G-E
PETER B. HANSEN, Graybar Electric, Minneapolis
WILLIAM N. HARRISON, Philadelphia Electric, Philadelphia
E. J. HARVEY, G. E. Supply, Buffalo
S. H. HAZLETON, JR., Pacific Div., G-E
G. R. HOFFMAN (Deceased), Graybar Electric, Reading, Pa.
HOWARD HOLIDAY, F. D. Lawrence Electric Co., Cincinnati
P. R. HOLMES, Continental Div., G-E
J. H. HOWARD, Huntington & Guerry, Greenville, S. C.
R. S. HUNTINGTON, Huntington & Guerry, Greenville, S. C.
A. H. JONES, Madison Electric, Detroit
R. E. JORDAN, Empire Division, G-E
F. E. KEENER, Southeastern Div., G-E
G. F. KEHOE, G. E. Supply, Buffalo
I. KERMODE, G. E. Supply, Cleveland
C. N. KNAPP, Southeastern Division, G-E
L. J. KNEIL, Madison Electric, Detroit
ROBT. A. KOBLIZK, Parr Electric, Newark, N. J.
FRED J. KRAMER, Columbus & So. Ohio Electric Co.
K. C. LARABEE, Continental Div., G-E
PETER LEE, Graybar Electric, New Haven, Conn.
J. J. LIESKE, JR., Graybar Electric, Grand Rapids
H. G. LINDER, Graybar Electric, Rochester, N. Y.
A. E. LONGMATE, Pacific Div., G-E
HARLOW LOOMIS, Philadelphia Electric, Philadelphia
J. L. LUND, Cleveland Electric Illuminating Co., Cleveland
LESLIE D. LYON, Consumers Power, Jackson, Mich.
HARRY M. MacFARLANE, Madison Electric, Detroit
JAY MANN, Electro Manufacturing, Chicago
T. R. MACAULAY, Graybar Electric, Flint
R. A. MATTHEWS, G-E Supply Corp., Columbus
JAMES E. McGIRR, Cuny & Guerer, New York City
JAMES T. MEADOR, Southern Electric Service, Charlotte
FRANCIS H. MEIER, Consumers Power, Muskegon
H. M. MERRICK, Continental Div., G-E
LEE W. MORGAN, Potomac Edison, Hagerstown, Md.
R. G. MORISON, Atlantic Division, G-E
FRANK C. MUELLER, Cleveland Electric Illuminating Co., Cleveland
V. NEMEROFF, Electro Manufacturing, Chicago
C. E. NOONAN, Graybar Electric, Buffalo
C. M. OLDACH, Elliott-Lewis Electric, Philadelphia
L. J. O'BRIEN, Graybar Electric, Milwaukee
G. E. PARK, Southeastern Division, G-E
MARK D. PELTON, Empire Div., G-E
RAY E. PERRY, Kansas City Power & Light, Kansas City, Mo.
E. J. PERKINS, Holophane Co., Boston
ARTHUR J. POPKIN, Holophane Co., New York City
D. W. PRIDEAUX, Northern Div., G-E
EDWARD M. REID, Benjamin Electric Manufacturing, Des Plains, Ill.
JESSE RHOADS, Graybar Electric, Baltimore
RAY RIDDLE, Madison Electric, Detroit
LOUIS A. ROBINSON, Wheeler Reflector Co., Newark, N. J.
E. J. ROMMEL, Toledo Edison, Toledo
J. A. ROYCE, Graybar Electric, Rochester, N. Y.
J. R. RUTLEDGE, Huntington & Guerry, Greenville, S. C.
J. W. RYAN, JR., Atlantic Division, G-E
HARRY M. RYAN, Shepherd Electric, Baltimore
R. S. SCHOFF, Michigan Division, G-E
CARL J. SCHROEDER, Giffels & Vallet, Detroit
F. M. SHOLDERS, Graybar Electric, Kansas City, Mo.
L. P. SMITH, G-E Supply, Columbus,
C. M. SNYDER, New England Div., G-E
MICHAEL SPISAK, Madison Electric, Detroit
W. T. SWEENEY, Atlantic Division, G-E
JOHN A. TAYLOR, Blackstone Valley Gas & Electric, Woonsocket, R. I.
FRED TELDER, G-E Supply, Kalamazoo
A. S. TURNER, JR., Continental Div., G-E
HUGH A. TUTTLE, Madison Electric, Detroit
ROY W. VERSHURE, Madison Electric, Detroit
HERBERT B. VOLK, Graybar Electric, Buffalo
S. E. WADDILL, G-E Supply, Norfolk, Va.
J. EDWIN WATKINS, New England Division, G-E
J. F. WATKINS, Atlantic Division, G-E
CHARLES WEBB, Perry Mann Electric Co., Greenwood, S. C.
P. J. WEBB, Graybar Electric, Rochester, N. Y.
W. S. WHEELER, Graybar Electric, Philadelphia
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P. M. WOOD, Continental Division, G-E
W. F. YEAGER, Continental Div., G-E

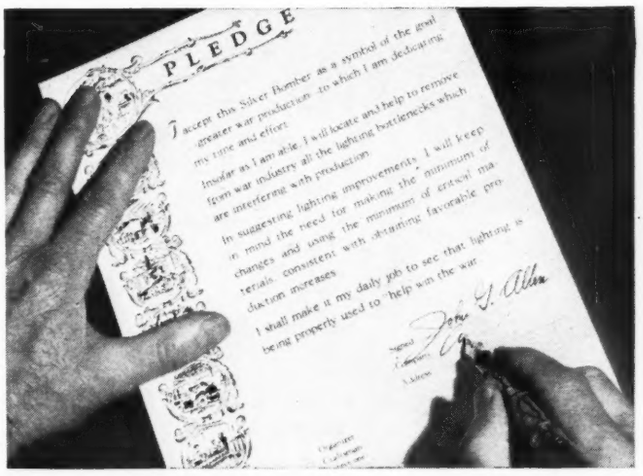
SILVER BOMBER LAPEL BUTTON

GOLD BOMBER PIN

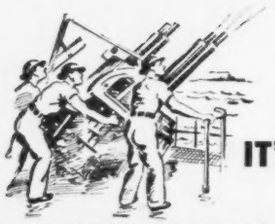
Of the 2907 lighting men who had signed the pledge at the right by December 7, 1942, the 139 men listed above have already helped save 100,000 man-hours or more and are wearing the Gold Bomber pin. In addition to these, lighting men in all sections are fast approaching that goal.

* * *

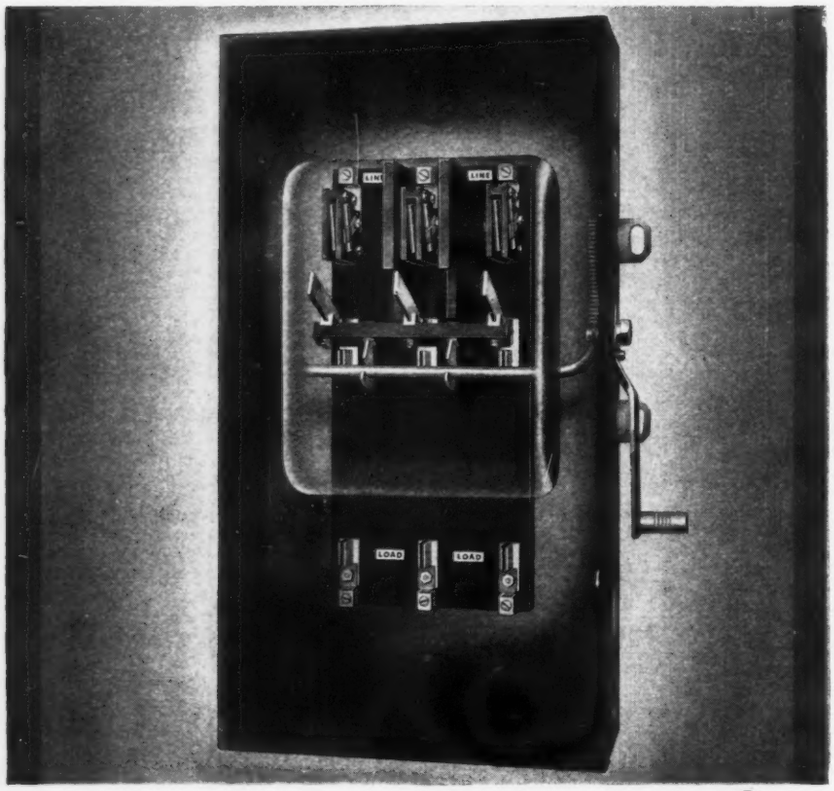
THIS IS THE PLEDGE that 2907 lighting men have signed indicating their determination to help war plants speed production with better lighting.

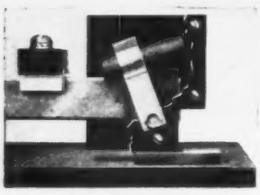


GENERAL ELECTRIC

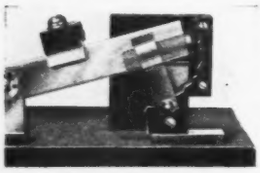


IT'S YOUR PIGEON, TOO, MISTER

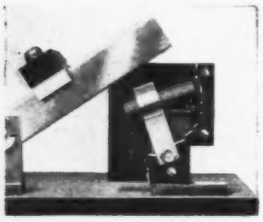




View of Rolarc snuffer showing blade in full engagement with live contacts before passing thru rollers towards OFF position.



View of Rolarc snuffer showing blade at point of final disengagement from live contact jaws.



View of Rolarc snuffer showing blade after disengagement from live contact and rollers. Rollers snapped together again obstructing path of possible arc.

THE FEDERAL *Rolarc* .. DESIGNED TO DO THE JOB

Winning the war is our problem—our job as much as it is the job of the men manning the guns. It's our "Pigeon"—and yours.

To get the job done—to help do it faster and better—Federal developed the 575 Volt Rolarc Safety Switch. Here's a dependable, hard working switch, 100 to and including 600 ampere capacity, built to carry the load.

Engineered on an entirely new principle of arc control, the Rolarc reduces the possibility of arcing to an *absolute minimum.* It lengthens switch life and conserves war-vital copper . . . it increases the safety factor and saves priceless time and power by eliminating dangerous arcing . . . it increases production by eliminating delays caused by switch failure.

If production is "your pigeon" let the Federal Rolarc Safety Switch help get the job done. *Get all the facts—write for bulletin 42-12.*

Until stocks on hand are exhausted we must reserve the right to ship our regular 575 Volt Safety Switch unless Rolarc is specified on the order.

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PANELBOARDS • SWITCHBOARDS • SAFETY SWITCHES • CIRCUIT BREAKERS

BOOKS *you may want*

MICROWAVE TRANSMISSION, by J. C. Slater (first edition), 310 pages, 6x9, illustrated. McGraw-Hill Book Co., $3.50. Microwaves are electromagnetic waves in the one meter to one centimeter region, which is not far from the wave length of infrared rays or heat. The behavior of microwaves is therefore very different from long waves having a frequency of 60 cycles. The design of a transmission line at power (60 cycle) frequencies is outlined by the electric circuit theory; as the frequency increases, the electric circuit theory is no longer adequate and Maxwell's equations must be resorted to for the development of the characteristics of microwave transmission.

Wave guides of various sorts, such as hollow pipes of circular and rectangular cross-section, parallel wires and co-axial lines are described and equations are introduced which allow for the mathematical treatment of ultra-high frequency transmission lines so that attenuation is minimized and effects of reflection are reduced. Composite transmission lines are developed and the design includes methods of reducing the abruptness of the discontinuities, caused by changes of cross-section in hollow or rectangular wave guides, changes in the material and coupling to other transmission lines.

The theory of radiation from antennas is developed by using Maxwell's equations in spherical coordinates; the design of microwave antennas is discussed together with the coupling of co-axial lines and wave guides thereto. Directive devices for antennas are given excellent treatment and the transmission and radiation of microwaves is thoroughly and adequately developed for all engineers who require a good theoretical knowledge of the behavior of waves in this ultra-high frequency region.—F. S. B.

★

FUNDAMENTALS OF ELECTRIC WAVES, by Hugh Hildreth Skilling (first edition) 186 pages, 6x9, illustrated, John Wiley & Sons, $2.75. A complete understanding of the theory of electrostatic, electromagnetic fields and vector analysis is most important to those studying ultra-high frequency phenomena. This book is admirably suited for such intensive study as it explains in detail the mechanics of the electrostatic and electromagnetic fields, and clearly explains the derivation and use of gradient, divergence, curl, vector fields and vector potentials. The behavior of dielectric materials when subjected to field flux is discussed together with an explanation of the theory of polarization of materials when used as dielectrics.

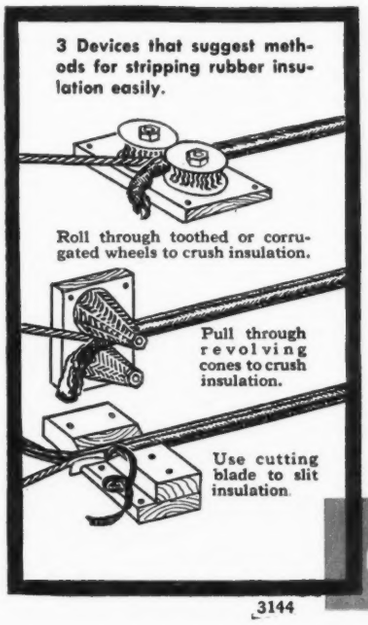
Maxwell's hypothesis and equations are adequately and clearly treated in a manner to eliminate much of the difficulty many students experience. Poynting's theory is of importance and in high frequency work Poynting's vector field is described and its relation to electric current and the electric field is shown.

The last chapters give a description of plane waves and their practical use, together with a discussion of radiation, antennas, wave guides and a treatment of wave patterns in hollow wave guides.

This book can be highly recommended to those who desire a basic knowledge of the theory of high frequency waves. The mathe-

(Continued on Page 12)

that Rubber Scrap is Priceless!


3 Devices that suggest methods for stripping rubber insulation easily.
Roll through toothed or corrugated wheels to crush insulation.
Pull through revolving cones to crush insulation.
Use cutting blade to slit insulation.

3144

The rubber insulation of wire and cable is even more valuable today than the copper conductor, scarce as copper is! Saving vital copper is absolutely necessary, of course, but the rubber in wire and cable insulation is priceless. The rubber shortage is so acute that immediate corrective measures in both military and civilian life have become necessary. So get into the scrap and salvage both copper *and* rubber.

Okonite cords, cables and insulations have extra years of service built into them. Get these extra years of service by using every precaution for their protection and longevity.* But, if they can no longer be used, *strip* off the rubber insulation and sell it to a licensed rubber dealer and sell the copper conductor to a metal dealer.

The scrap you save here and now may later become the difference between victory and defeat on some far-flung battlefield.

*If you have not already received a copy of the booklet "Do's, Don'ts and How's For Longer Life of Your Insulated Wires and Cables" write for a copy today.

THE OKONITE COMPANY
Passaic, New Jersey Offices in Principal Cities

OKONITE Insulated Wires & Cables

Salvage Your Scrap — Buy U. S. War Bonds

TAKING care of tools is always good business. In times like these, when our Armed Forces need every tool that can be produced to keep a mechanized war rolling, it is doubly important to look after those you have.

The high quality of Klein equipment assures long life.

Take care of your pliers and wrenches—take care of your grips and climbers—take care of your belt and safety strap. If they're Klein's, you are fortunate in possessing equipment that is designed to give you the maximum in service. Proper care will assure your getting that service.

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matics involved is similar to that given during the usual college courses. There are many illustrations, some of which are quite novel in their presentation. The problems are such as to stimulate clear thinking and the material is arranged and presented in a good logical manner.—F.S.B.

LETTERS
to the editor

Editor ELECTRICAL WEST:

In the December 1942 issue of ELECTRICAL WEST . . . page 84, you published an article about labor union activities on the Pacific Gas and Electric Co. system, which begins as follows:

> "Before the year's end all employees on the Pacific Gas and Electric system will have voted in NLRB elections to select a collective bargaining agency from either the CIO Utility Workers Organizing Committee or the AFL International Brotherhood of Electrical Workers."

Your statement as quoted above is . . . false . . . and damaging to this organization which is a duly incorporated, existing and operating independent labor union holding exclusive bargaining contracts with the Pacific Gas and Electric Co. as successor to the San Joaquin Light & Power Corp., which contracts cover all employees in the San Joaquin Power Division of the Pacific Gas and Electric Co. . . .

Our existence is a matter of public record. We were incorporated under California laws in May 1937. In the summer of 1941, IBEW filed charges before the NLRB against PG and E Co. charging us to be an illegal union under the Wagner law. After an investigation by Robert Condon of the San Francisco office of NLRB, a conference in the matter, where we were represented, was held in the board office at San Francisco on Sept. 27, 1941. We elected to fight the charges. A hearing was held before Examiner Robert M. Gates in Fresno, closing on Dec. 10, 1941. On May 5, 1942 Mr. Gates filed his report finding against us. On Sept. 22, 1942 the matter was orally argued before the labor board in Washington, D. C., Mr. Arthur C. Shepard of Fresno appearing in our behalf. To date we have no decision from the labor board although one is certainly due.

Meanwhile we have announced our intention of contesting any adverse decision of the labor board in the Ninth Circuit Court of Appeals and, if necessary and possible, to the U. S. Supreme Court. Also, meanwhile, we are negotiating as usual with the PG and E Co. as the contractual exclusive bargaining agent for all employees, office as well as physical, under contracts which cannot be cancelled prior to April 1943 and which cannot be legally set aside without an order of the federal courts from which there is no appeal.

Under the circumstances we believe that we are entitled to, and we therefore request it of you, a retraction of the above quoted statements together with a statement of the facts that this union is a going concern. . . .

MIKE S. OLDERSHAW, *President*
Western Utility Employees Union
Bakersfield, Calif.

We cheerfully correct a sin of omission.—Ed.

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and Most Types of Portable or Mobile Equipment

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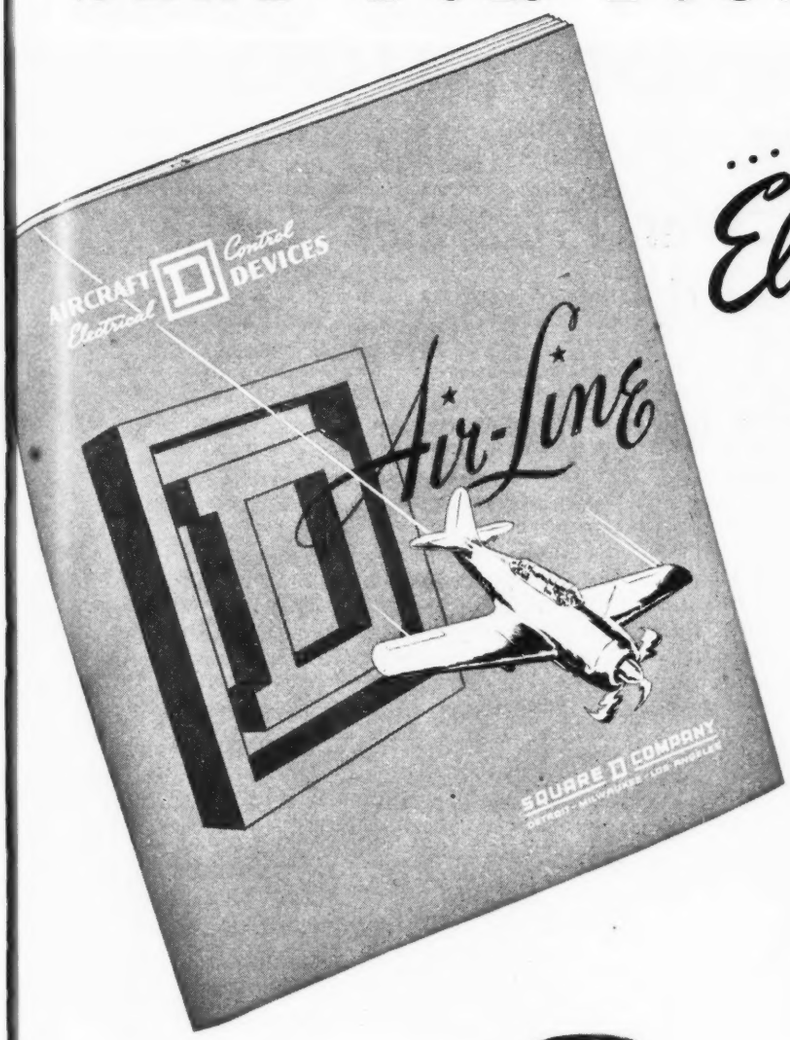

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Circuit breakers, switches, relays, contactors, push buttons, limit switches, special purpose devices—all are included in the new Square D *"Air-Line."* This complete catalog gives detailed descriptive and engineering information.

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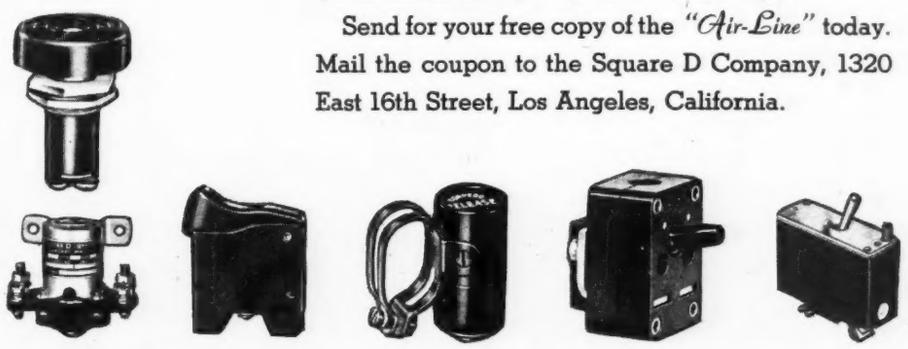
SNAP-ACTION PUSH BUTTONS ★ MAGNETIC CONTACTORS AND RELAYS ★ MANUALLY-OPERATED SWITCHES ★ CIRCUIT BREAKERS



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T. E. Kuryla (left), salesman, General Electric Supply Corporation, Erie, Pa., is shown in the photograph helping H. W. Alexander, manager of the Surgical Lighting Division of the American Sterilizer Co., Erie, to take off wiring devices, wire and conduit fittings needed for new germicidal units. Note unit on desk.

G-E WIRING MATERIALS DISTRIBUTORS

Offer Help in War Production Centers the Country Over

Wiring materials suitable for war projects are handled by G-E Wiring Material Distributing Houses close to the projects. Over 175 of these distributors are located at key points in all parts of the United States. They are eager to join with customers in aiding the war effort.

See the G-E Wiring Materials Distributor near you for wiring materials needed for converting wiring to war purposes . . . for maintenance . . . for new wiring. You'll find this distributor's knowledge of new developments and methods helpful too.

The conduits, wires and cables and wiring devices handled by the G-E Wiring Materials Distributor near you are high quality. They are easy to install and will perform efficiently. Take advantage of this conveniently close source of materials. You'll be pleased with the helpful service given and with the materials.

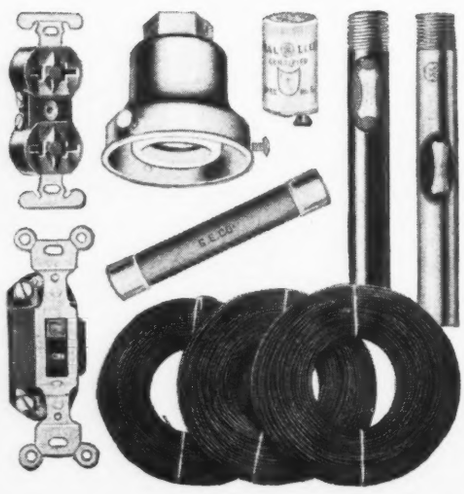
J. W. Davis (left), salesman, General Electric Supply Corporation, Joplin, Mo., is helping P. L. Maeder, Gray Electric Co., Joplin, to take off wiring materials for a rush industrial job.

The G-E wiring materials field force is divided into geographical districts in order to provide greater help for distributors and their customers. Here is J. O. Dillingham, manager of District No. 6. His headquarters are in San Francisco, Calif.

FOR G-E WIRING MATERIALS

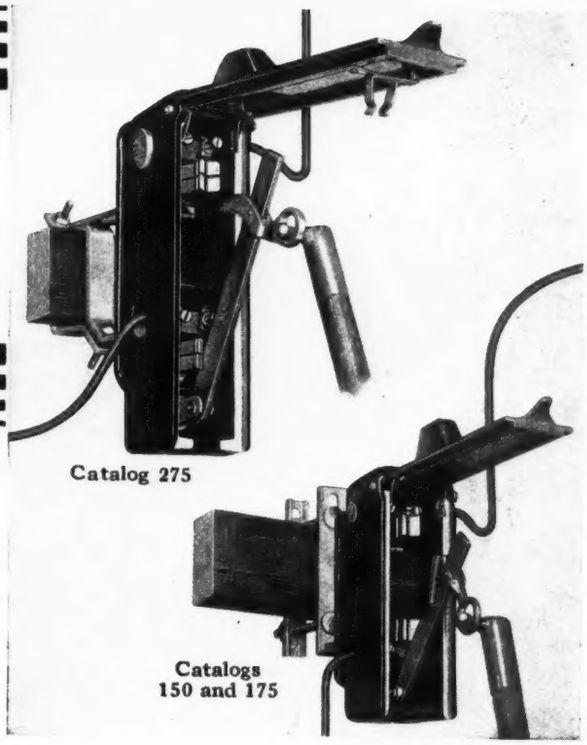
Ask the G-E Wiring Materials Distributor near you about G-E conduit, boxes and fittings, wire and cable and wiring devices to fit your needs. General Electric Co., Appliance and Merchandise Department, Bridgeport, Conn.

Seattle, Wash., General Electric Supply Corporation sales managers and salesmen are co-operating with customers in every way possible to aid the war effort. Here F. A. Block (left), supply sales manager, paused for this photograph while planning wiring materials delivery schedules for war project and W. E. Graham, marine fittings sales manager, is checking materials needed at shipyard.



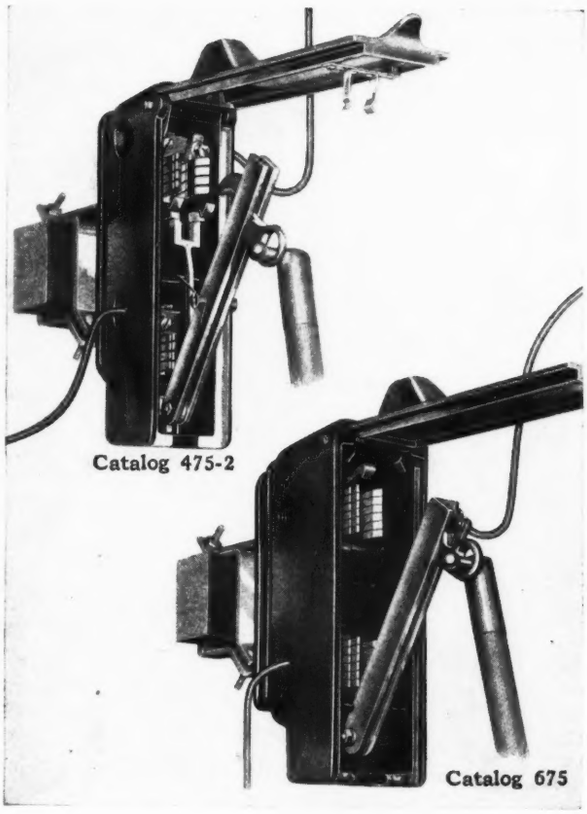
GENERAL ELECTRIC

SAFE
STURDY
COMPACT



Catalog 275

Catalogs
150 and 175



Catalog 475-2

Catalog 675

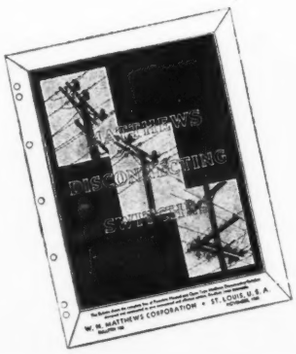
They are SAFE.—These switches are of the dead blade type, have ample insulation values, will not over-heat and will cause no radio noise interference at operating voltage.

They are STURDY.—Heavy bus bar copper blades, large copper contact clips reinforced with phosphor bronze retainer clips, positive clamping terminal connections and strong moulded bakelite doors assure year in year out service.

They are COMPACT.—On crossarm or vault installations where limited space is a factor, they can be more readily installed.

Porcelain Housed Matthews Disconnecting Switches are available in the following sizes:

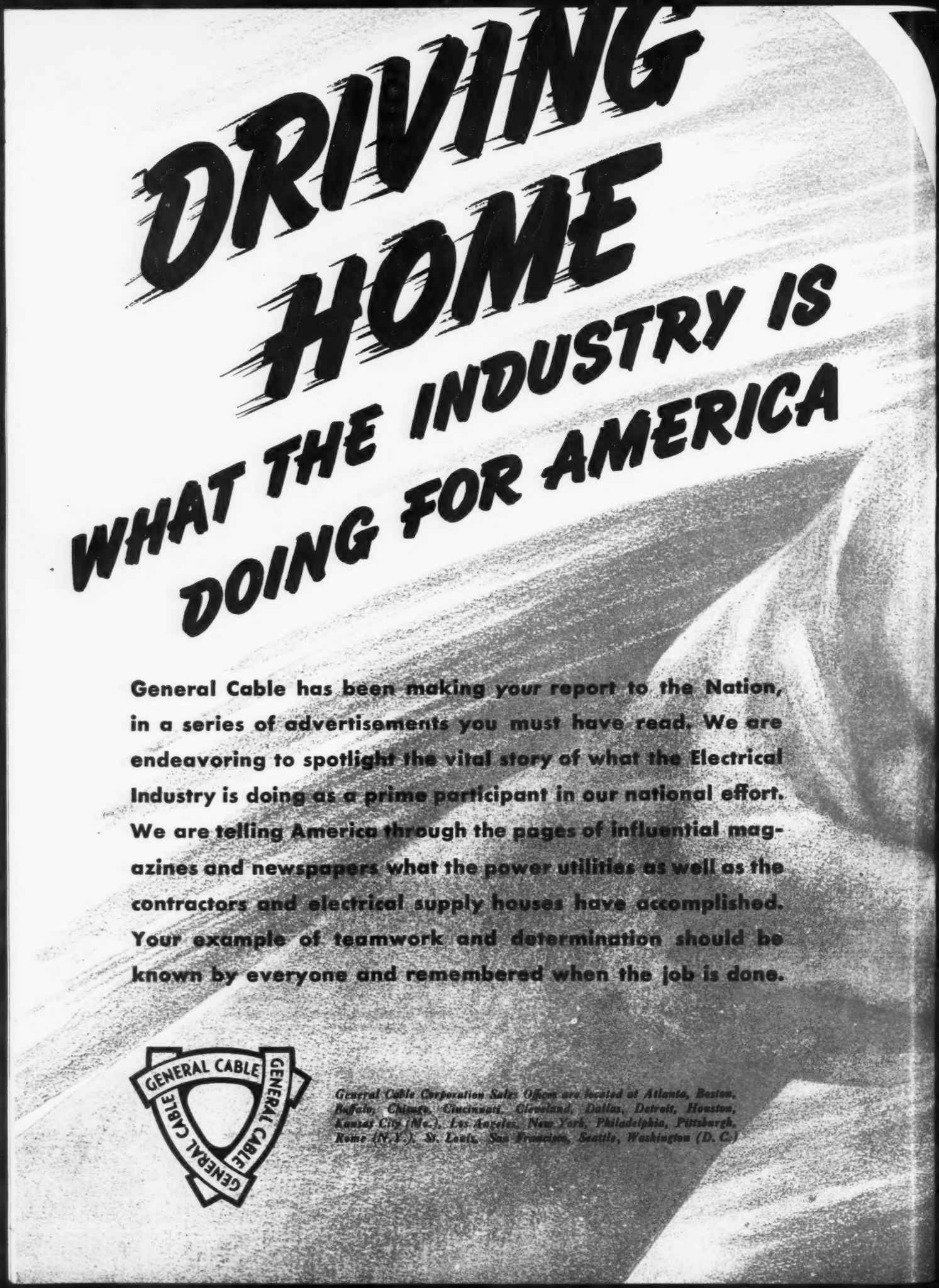
100 Amp. 5 Kv. — 100 Amp. 7.5 Kv.
200 Amp. 7.5 Kv. — 400 Amp. 7.5 Kv.
600 Amp. 7.5 Kv.



Bulletin 106 fully describes Matthews Disconnecting Switches

Ask for your copy

W. N. MATTHEWS CORPORATION
SAINT LOUIS, U. S. A.
ENGINEERS and MANUFACTURERS SINCE 1899



General Cable has been making *your* report to the Nation, in a series of advertisements you must have read. We are endeavoring to spotlight the vital story of what the Electrical Industry is doing as a prime participant in our national effort. We are telling America through the pages of influential magazines and newspapers what the power utilities as well as the contractors and electrical supply houses have accomplished. Your example of teamwork and determination should be known by everyone and remembered when the job is done.

GENERAL CABLE GENERAL CABLE GENERAL CABLE

General Cable Corporation Sales Offices are located at Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Kansas City (Mo.), Los Angeles, New York, Philadelphia, Pittsburgh, Rome (N. Y.), St. Louis, San Francisco, Seattle, Washington (D. C.)

A SHOCK for Mr. Hitler

THIS is no mere play on words. Ours is a war of production...of armaments, of guns, of ships, of war materials. It is a war of speeded-up manufacturing...of machines and machinery.

And back of machinery is power...electric power that keeps production humming. Truly, the crushing blow that will eventually bring the Axis to its knees will come from the power of electricity as much as from the power of explosives. Yes, the stunning effect of this electrical power may well be called "a shock for Mr. Hitler".

Where is it coming from? Whence this gigantic massing of electric power from the Nation's generating plants? Whence the supply to meet the pyramided demand for wires, cables, switches, terminals...the thousand and one items that go into the making, transmitting and using of electrical power?

It came out of the teamwork that is the American way of doing things. The power companies threw into it their ready-and-waiting plans for plant expansion—for interconnection of systems, for unleashing their pools of power. The electrical manufacturers came through with increased production. The electrical supply warehouses looked after the distribution of equipment to meet the time schedules.

And back of it all, Washington guided, coordinated and applied the pressure where needed. To the War Production Board must go a lion's share of the credit. For the miracle has been wrought. Wherever a machine was installed in America's far-flung war-production line—there the wiring and the power were ready and waiting to start the wheels turning.

The Electric Power in back of American industry packs a wallop—an electrical wallop—a terrific "shock for Mr. Hitler".

☆ Not just one shock for Hitler...but a Series of JOLTS!

Nearly half of the entire productive capacity of all our industries breaking all records in turning out war material. . . .

More than 50% of the world's greatest concentration of Electric Power working to lick the Axis.

An Electric Utility industry with systems interconnected, fuel reserves accumulated, water power husbanded—Keeping pace with any war-industry expansion.

Utility Engineers bringing typical resourcefulness into play when power loads mount—ready to find ways to push boiler efficiencies beyond all previous limits, to install new-type cables to deliver the extra power. . . .

Newly built hydro-electric plants adding theirs to the vast output of the commercial generating stations.

Armies of skilled electrical contractors out on the industrial firing line, installing the wiring for constantly expanding production—guns, shells, tanks, ships, planes!

. . .

Men, pledging their skill to keep every electric installation in A-A maintenance condition.

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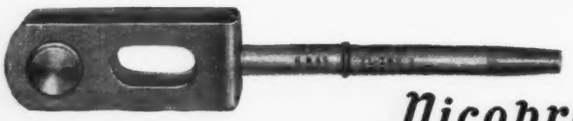
E AND INSULATED WIRES AND CABLES FOR EVERY ELECTRICAL PURPOSE

They're NATURALS . . .

for DEAD-ENDING Your Power Distribution Lines



Nicopress

NICOPRESS TOOL No. 51-PJ

SUSPENSION DEAD ENDS

They've got what it takes to stand up and deliver long trouble-free service:—ease and speed of installation—strength—security—long life and low costs.

Nicopress Suspension Dead-Ends permit the conductors to go straight through without bending or distortion, thus assuring a strength that exceeds the rated breaking strength of the conductors and make them "bears" for taking vibration punishment. No special tool is needed as work is done with same tool used in making Nicopress line splices.

Order from your jobber today

Completed Nicopress Suspension Dead-End

THE NATIONAL TELEPHONE SUPPLY CO.

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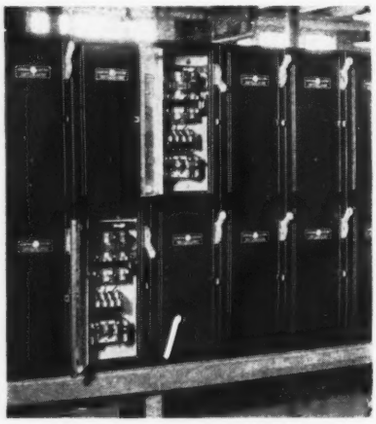
PRODUCTS

that are news

Motor Starters (100)

General Electric is manufacturing a new line of a-c combination magnetic starters for full voltage starting of induction motors up to 7½ hp. Now available only in NEMA sizes 0 and 1, these starters consist of a fusible motor-circuit switch and a magnetic starter incorporated in one compact unit. To facilitate mounting groups of starters close together, the operating handle is projected through the front rather than the side of the case.



Bimetallic overload relays are adjustable for either hand or automatic reset and protect the motor from overheating caused by repeated overloads, sustained overloads or too frequent starting, the manufacturer claims.

Portable Fan (101)

Chelsea Fan & Blower Co. has announced a small portable unit to eliminate gases, fumes, etc. from closed-in places. This unit, the Octopus Jr., is powered by a ¾-hp. ball bearing motor; sucks or blows 2,000 cfm. It has flexible hose adapters for three 4-in. nozzles or four 3-in. nozzles, with caps to close nozzles not in use. Each 4-in. metal hose of 20-ft. length will exhaust 250 cfm; each 4-in hose more than 200 cfm. Weight 70 lb.

Insulation Materials (102)

As a substitute for varnished silk, Irvington Varnish & Insulator Co. has developed varnished rayon, cotton cloth and Nylon. According to the manufacturer, these materials possess good dielectric strength with tensile and tear strengths equal to or better than varnished silk. They are available in thicknesses from .003 to .008 in. in straight-cut rolls or bias strips in 51-in. lengths. Nylon by government allocation only.

Multi-Contact Timers (103)

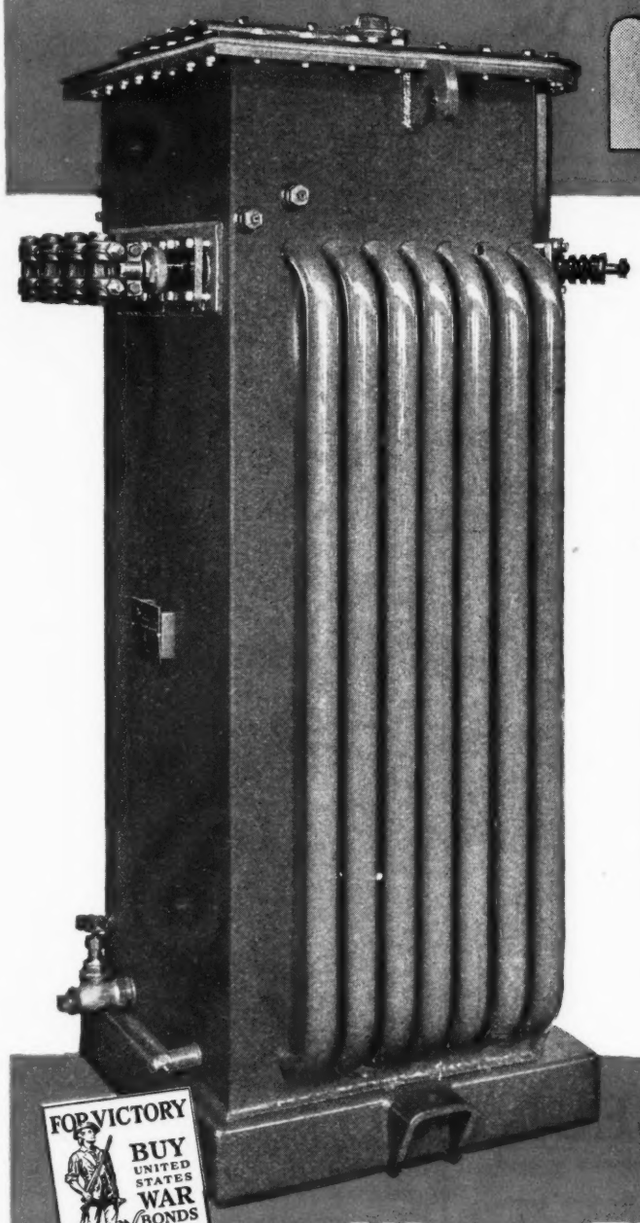
A new line of multi-contact timers has been put on the market by the R. W. Cramer Co. Features announced by the manufacturer are self starting synchronous motor; complete gear trains operating in oil; bakelite cams mounted on shaft in identical pairs so that "off" and "on" increments can be adjusted to the operating program.

WAGNER

NOFLAMOL TRANSFORMERS

(NON-INFLAMMABLE LIQUID-FILLED)

Give you a combination of advantages worth investigating



★ **INDOOR INSTALLATION WITHOUT VAULT**

Noflamol transformers may be installed indoors without the use of expensive fireproof vaults since the liquid used in the transformers is non-inflammable. Considerable installation expense is thereby avoided.

★ **IMPROVED PLANT EFFICIENCY . . .**

Savings are effected by dividing the circuit into several sections and placing a Wagner Noflamol transformer at the load-center of each, eliminating long runs of secondary copper, reducing line losses, and improving voltage regulations. Plant efficiency is thereby improved.

★ **NO SPECIAL FOUNDATIONS . . .**

The only foundation necessary for installation of Wagner Noflamol transformers is a level floor, strong enough to support their weight.

★ **SAVES VALUABLE FLOOR SPACE . . .**

Wagner Noflamol transformers may be installed in out-of-the-way places, thereby releasing valuable floor space for production. Since no vault is needed, less space is necessary for a Noflamol transformer installation.

★ **SAVES MAINTENANCE EXPENSE . . .**

The liquid used in Noflamol transformers is chemically stable, has high dielectric strength, and will not sludge.

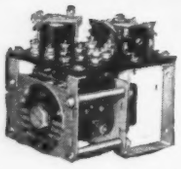
Bulletin TU-33 describing Wagner Noflamol transformers will be mailed on request.

T43-1

Wagner Electric Corporation

6400 Plymouth Avenue, Saint Louis, Mo., U.S.A.

TRANSFORMERS • MOTORS • BRIDGE BRAKES



IT'S IN THE NAVY NOW

This motor driven, time delay relay has been used for years as a time control in drying systems, heat treating ovens and illumination.

Now it's in the Navy. The positive action, ruggedness and resistance to shock and vibration of this relay, make it ideal for alarm control, communication circuits and for the protection and timing of many kinds of equipment aboard ship. Manufacturers can often find items in the regular line of Ward Leonard Controls that will serve their needs.

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WARD LEONARD

RELAYS • RESISTORS • RHEOSTATS

Electric control (WL) *devices since 1892.*

WARD LEONARD ELECTRIC CO., 68 SOUTH STREET, MT. VERNON, NEW YORK

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Pat. Nos. 2200443 2228210

YOU'VE GOT THE BEST!

Lloyd's start quicker—work better—last longer. Specified repeatedly as the standard of quality and performance.

Listed and Approved by Underwriters' Labs. Inc., and Canadian Engineering Standards Association. Certified by Electrical Testing Lab.—Spec. 6. Certified to Fleur-O-Lier Standards.

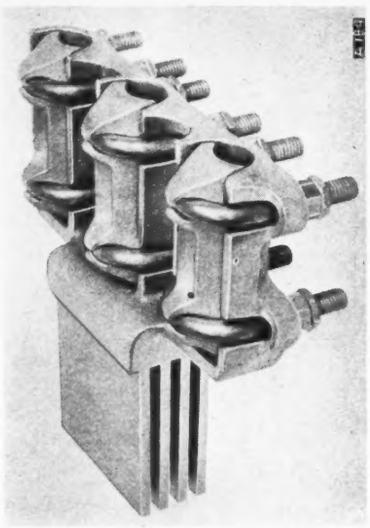
LLOYD POLICY INSURES QUALITY

LLOYD PRODUCTS CO.

DEPT. EW-1 PROVIDENCE, R. I.

Representatives—Branch Offices—Warehouse Stocks in 23 Leading Cities

Solderless Fittings (104)



To meet present demands, Delta-Star Electric Co. has developed a new line of solderless fittings for multiple cables. The line includes tees, straight connectors, lugs and strain clamps. Illustrated is a heavy-duty high-compression type solderless lug for use with three 1,000,000 CM cables and for connecting to a flat-bar type equipment terminal.

Wire Cutter (105)

A wire cutter with a long reach has been announced by the American-LaFrance-Foamite Corp. This cutter has a slotted jaw, which holds wire by gravity until the cut is made. The 1½-in. jaw opening will take heavily insulated wire, and will cut up to 4.0 hard drawn copper cable. The handle, two 4-ft. sections of Douglas Fir or spruce, is insulation tested for 75,000 volts per foot, the manufacturer claims. Cutting action is controlled by a rope of insulation-tested spot cord.

Power Package (106)

A power package for aircraft subassemblies is offered by General Electric Co. Package designs are available for applications including bomb-door operation, landing gear and wing-flap operation and operation of control and protective devices. Items required for a specific job are included in these packages, which are designed for 24-hour service and are available in ratings from about 1/100 hp. to 3 hp.

Rubber Lung (107)

A rubber lung for administering artificial respiration has been developed by the E. D. Bullard Co. The device is strapped to the back or stomach and adheres to the body through suction. Raising and lowering the lung handle at normal breathing rate activates the muscles, causing them to inhale and exhale air, the manufacturer states.

Blackout Lamp (108)

A blackout safety light has been developed by Owlite Illuminators. This light gives out a reddish-orange light from one side of the globe. Other parts are opaque, preventing a visible glow from the side toward the window, the manufacturer states. The unit fits regular electric light socket and sells for 35c.

a Check List for Wartime Transformer Buyers

Get these 5 Pyranol features and you are sure of reliable service

1. **High emergency-overload capacity.** The heat storage capacity of Pyranol makes Pyranol transformers ideal for emergency overloads.

2. **Stamina to withstand voltage surges.** High dielectric strength (inherent in liquid-filled transformers) is an extra safeguard against damage from voltage surges due to lightning or switching operations.

3. **Noninflammability.** You can't burn Pyranol. No Pyranol transformer has burned, or contributed to a fire. This record, covering 10 years of operating experience, fully justifies the recognition accorded Pyranol transformers by the National Electrical Code.

4. **Virtual freedom from maintenance.** The efficiency and life of Pyranol transformers do not depend on frequent cleanings and other attention. Pyranol is nonoxidizing and nonsludging. Under normal operating conditions it will maintain its insulating properties through years of service.

5. **Protection against moisture and dirt.** The pressure-tight steel tank protects vital transformer parts against moisture, dirt, dust, abrasives, and other enemies of transformer reliability.

TRANSFORMER reliability is a big factor in continuity of power supply, and that's essential to maximum war production. Pyranol units have all the features—*plus*—that have made liquid-filled transformers the most nearly trouble-free electric apparatus in service today.

Save Vital Copper, Too

An actual example of savings: One new war plant saved 30,000 pounds of copper (because of shorter runs of heavy secondary conductor) by installing Pyranol transformers indoors at load centers.

Moreover, by locating transformers near the load, you get better voltage regulation and lower line losses.

For complete information on Pyranol transformers for your requirements, consult your G-E representative. Or, write General Electric, Schenectady, N. Y.

333-kva Pyranol transformer, incorporating Spirakore design. Rated 60 cycles, 2400/4160Y volts to 240/480 volts.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC

112-43-5100

ENCORE

Hotpoint's War Bond Advertising Program Will Play a Return Engagement in 1943

FROM all quarters—government officials, war savings administrators, utility companies, department stores and retailers—comes praise of Hotpoint's forward-looking plans for wartime advertising.

The slogan "Buy War Bonds Today — Electric Kitchens Tomorrow," was introduced by Hotpoint as a wartime national advertising theme. It not only stimulates the sale of War Bonds, but creates confidence in the future that will build a backlog of consumer demand by encouraging a patriotic accumulation plan to assure funds with which people can buy the products of peace. Thus the program helps the war effort today and provides for postwar prosperity and peacetime employment.

Widespread support of the theme through local advertising and use of Hotpoint's novel Home Planning File in hundreds of cities has been gratifying. The program has been so successful that it will be continued in 1943 with increased advertising in the leading national magazines.

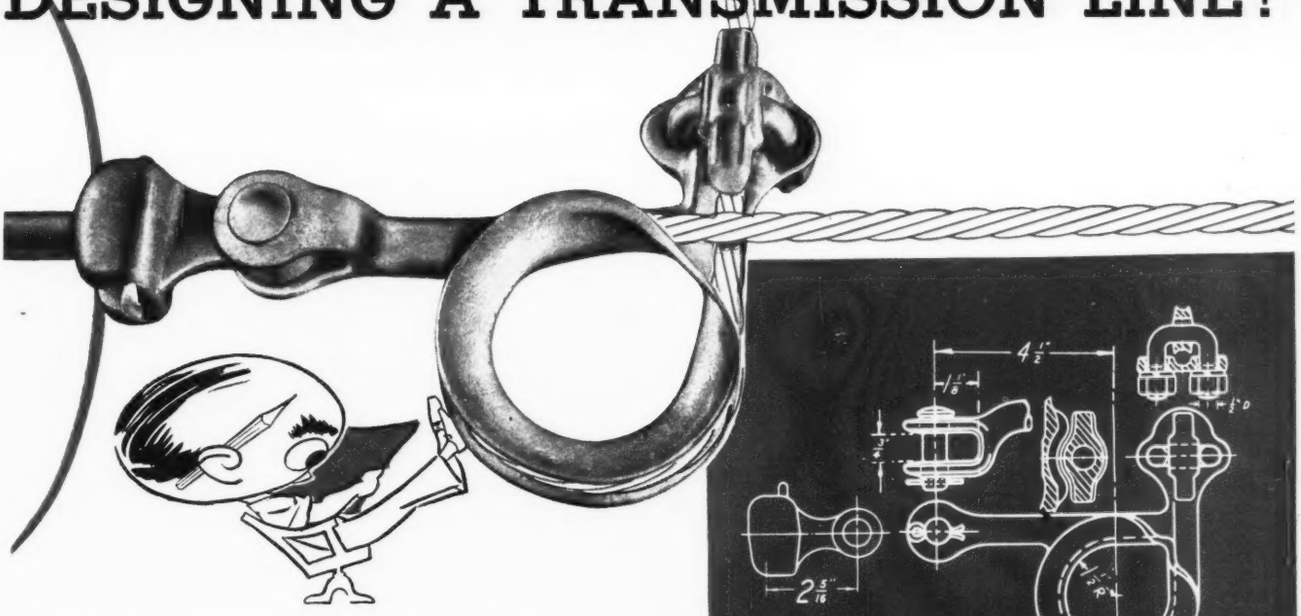
Plan now to tie up with this great program in 1943 by providing for it in your activities. Further details will be released during January. Edison General Electric Appliance Company, Inc., 5612 West Taylor Street, Chicago, Illinois.

Hotpoint

ELECTRIC KITCHENS

Refrigerators • Ranges • Water Heaters • Washers and Ironers • Clothes Dryers • Automatic Dishwashers • Electrasink • Steel Cabinets

DESIGNING A TRANSMISSION LINE?



Here is a complete line of Strain Clamps for your lighter Transmission and Distribution Circuits

These clamps are the familiar and universally accepted "Snail-Shell" Snubbing design.

Each size is suitable for a wide range of cable diameters.

The close-coupling, plus the lightweight of the **forged steel parts** are important factors in reducing cable vibration.

Each clamp is the side-opening type, hence simple to install and easy to work with hot-line tools.

No necessity for cutting the cable and providing separate jumper-loop and additional clips or connectors.

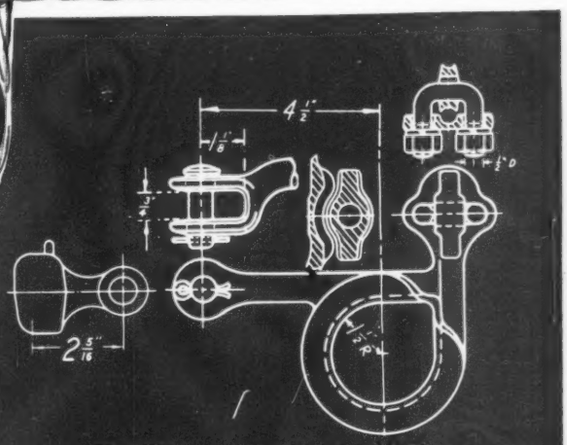
Suitable for the small sizes of Ground Wires. (Sometimes furnished for this service with heat-treated parts to obtain increased strength). Be sure to consult us and advise size, type and strength of ground wire.

THE BREWER-TITCHENER CORP.
Cortland, New York

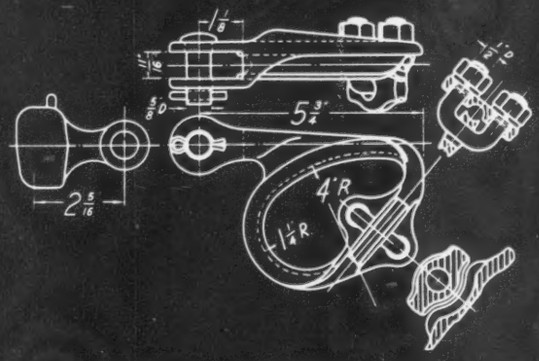
Specify a Forging

BTC

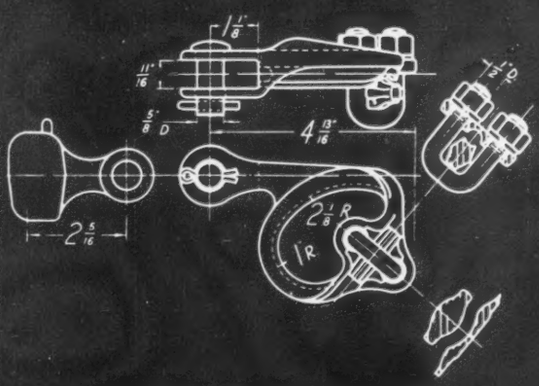
This BTC Hi-Line reference book on request



No. 7511 — for 0.16 to "0.55" cable diameter including widening armor ribbon if used.



No. 2104 — for 0.187 to "0.50" cable diameter including widening armor ribbon if used.



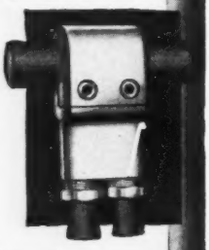
No. 2102 — for 0.128 to "0.375" cable diameter including widening armor ribbon if used.

"You have ALL Types of Tees to choose from—

—in the COMPLETE line"

All in one catalog, for your handy selection—*every* good type of tee connector... Each one carefully designed and tested, and manufactured under rigid engineering supervision.

Penn-Union Type HFM, with one-bolt or 2-bolt hinged clamp for the main. One or more branches can be connected afterward. Multi-slit tapered sleeve assures permanent grip on branch.



Penn-Union Hinged E-Z Tee takes a wide range of branch sizes. One-piece design makes installation easy. Tap connections can be made at any time.

Clamp Type Tees for all sizes of tubing and cable—a complete line. Machined contact surfaces.

Types for All Combinations—for connecting flat bar, run or tap, to tubing or cable. Also "general utility" tees that take a wide range of conductor sizes.

Penn-Union E-Z Tee is ideal for accommodating a large range of conductor sizes on both the main and branch. Will not loosen. 2, 3 or 4-post.

NORTHWESTERN AGENCIES
2411 First Ave., Seattle, Washington

F. M. NICHOLAS CO.
1123 Harrison St., San Francisco

KENNETH ANDERSON CO.
334 East 4th St., Los Angeles

Penn-Union Electric Corp., Erie, Pa.

PENN-UNION
Conductor Fittings

Wooden F-Unit (109)

Wakefield Brass Co. has developed a wooden fluorescent lighting unit, which it claims saves 27 lb. of steel per 4-lamp unit. Louvers are of bass-wood; side frame and exposed end frame are of birch in a walnut finish. All wooden pieces are anchored with metal pins at corners and cemented with glue to withstand humidity changes. Reflector is of Masonite with a "V" shaped deflector between each pair of lamps. Reflecting surfaces are coated with infrared baked white synthetic enamel. Standard in 2, 3, 4 and 6-lamp units and may be secured for continuous runs on special order.

Floodlight (110)

General Electric Co. is manufacturing a floodlight with a bowed-in silvered glass reflector which it claims creates the equivalent of a larger unit in its collection and utilization of light. A standard 1,000-watt lamp is used.

The reflector's shape permits the light to be reflected back to the parabolic surface,

where it is redirected outward as part of the main beam. Serving also as the floodlight casing, the reflector is backed with an extra coating of electrolytically deposited silver to make it shatter-resistant.

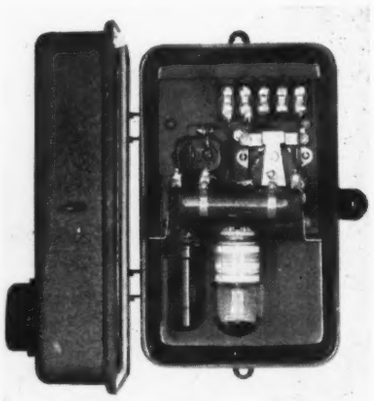
The unit can be equipped with a metal visor for use in dimout areas where outdoor night work must continue.

New Lighting Units (111)

Keese Engineering Co. has announced new lighting units. Included are high intensity blue printing and copyboard lighting units and fluorescent wing jig lamps for aircraft plants. The new T9-1,200-watt photo chemical tube is a low voltage, high intensity light source of 48,000 lumens and is recommended by the manufacturer for all photo, photochemical and photographic purposes. The 3 kw. tube is a high intensity tube designed primarily for high bay lighting and delivers 120,000 lumens.

Photoelectric Controls (112)

Photoswitch has announced an improved series of photoelectric controls. Type A15, for industrial applications. Relay contacts are designed to handle heavier loads directly and are conservatively rated at 10 amp. a-c, 115 volts, the manufacturer reports. Output terminals are those of a single-pole, double-throw switch for either normally closed or normally open operation, providing for action either when the light beam is broken or when it is made. Operating range of Type A15 is 20 ft. with light source L30 and 40 ft. with light source L60. Type A25 is supplied with light source L30 for 50-ft. operation and with light source L60 for 100-ft. operation.



High Intensity Lamp (113)

A 4-light wood-reflector fixture is being manufactured by the Edwin F. Guth Co. for high intensity lighting in industrial inspection and high-bay areas. Bump-proof ends protect lampholders against abuse and insure correct distance between lamps, the announcement states. The reflector has deep light-cutoff and is of Masonite Reflector-Board. Available with Forlamp ballast for 265 volts, and for 110-125 and 220-250-volt circuits; in two sizes for four 40-watt or four 100-watt fluorescent lamps.

Spatterproof Lamp (114)

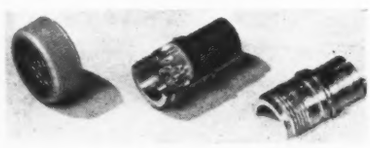
Radiant Lamp Corp. is manufacturing a new type spatterproof lamp for welding and rough industrial services. It is made of a special glass which resists penetration of hot metal, and has a T10 bulb with medium screw base. Sizes include 50, 75, 100 and 150 watts.

Ship's Range (115)

A full-width heavy duty electric range for installations having limited generating capacity has been designed by Electromaster, Inc. and is recommended by the manufacturer for small auxiliary vessels. Specifications include a full size oven with two 2-kw. units; automatic oven thermostat; removable sea rack; four round 2-kw. surface units.

Cable Connector (116)

An electrical cable connector that eliminates one coupling nut and one barrel and provides a 3-piece, split-shell construction is being manufactured by the Harwood Co. This connector is of die cast construction and, according to the manufacturer, conforms in all respects to Army-Navy specifications. It is offered in sizes from 10S to 48.

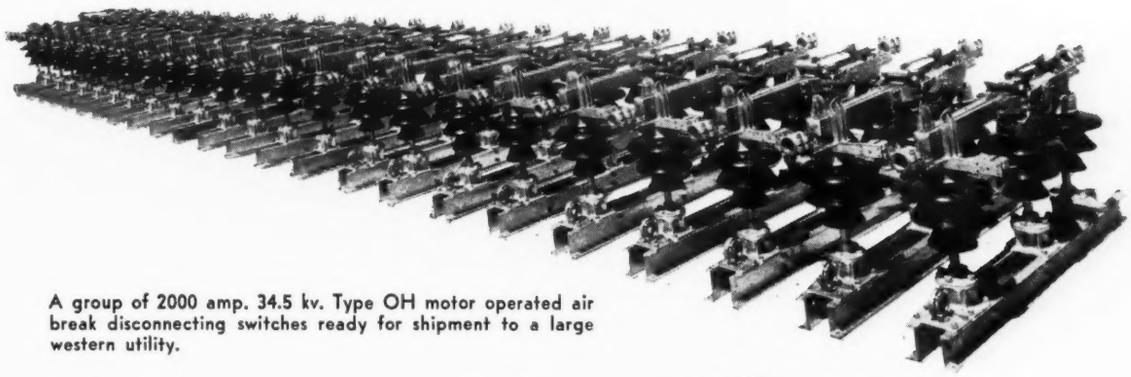


Industrial F-Unit (117)

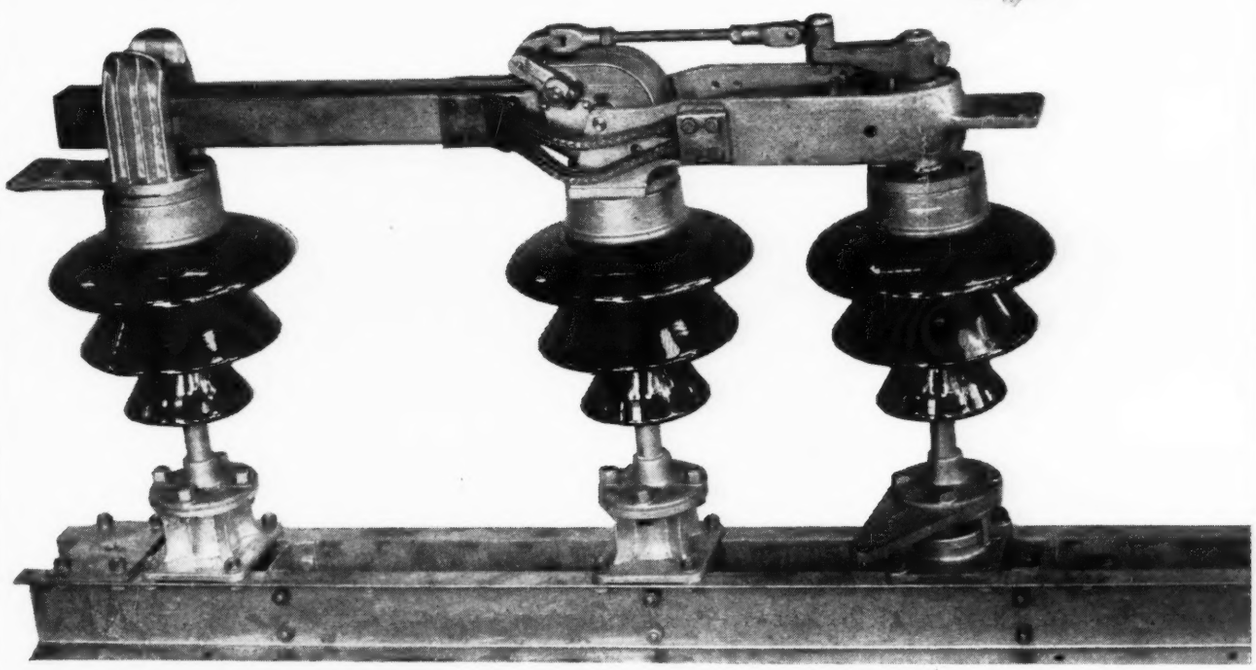
An industrial fluorescent unit using only 12 oz. of metal is being manufactured by Lighting Products Inc. Available for two and three 40-watt and two 100-watt lamps. Units for chain and pipe hangers and for surface mounting.

Aircraft Manufacturers—Utilities—Shipbuilders

YOU MAY NOT NEED 2000 AMPERE SWITCHES — BUT ONE OF OUR CUSTOMERS DID!



A group of 2000 amp. 34.5 kv. Type OH motor operated air break disconnecting switches ready for shipment to a large western utility.



LONG LIFE TROUBLE-FREE OPERATION

Maximum operating efficiency over a long period of time is assured by rugged design plus precision manufacturing methods used in producing Cole air break switches.

Silver to silver contacts are provided. Abrasion of the silver is prevented by contact pressure being applied automatically after closing and released prior to any blade movement before opening.

Minimum effort is required to operate them as the blades are balanced in all positions.

AIR BREAK SWITCHES
Manual or Motor Operated
7.5 kv. to 230 kv.
DISCONNECTING SWITCHES
BUS AND CABLE SUPPORTS
FUSE MOUNTINGS
FUSES
SWITCHBOARDS
INDUCTION RELAYS

Cole Electric Company

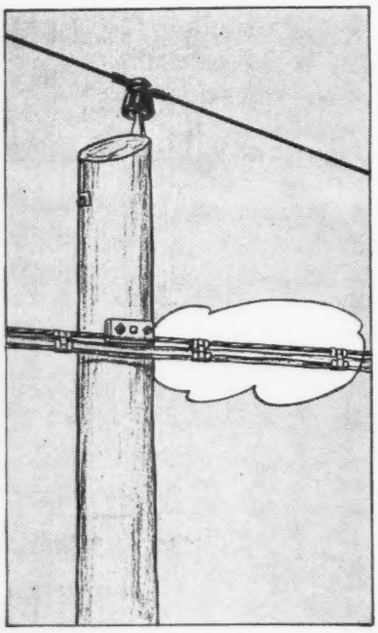
1510 South Los Angeles Street, Los Angeles, California

WESTERN REPRESENTATIVES

CONDON & YOUNG, INC.
357 S. Hill Street, Los Angeles

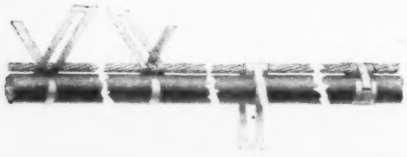
EICHER & BRATT
Colman Bldg., Seattle, Wash.

Reduce Outages
Avoid Cable Wear
Reduce Maintenance



RELIABLE CABLE HANGERS

Prolong life of cables and conserve strategic materials by eliminating wear on cable sheaths or on insulation of hand made cables. Reliable cable hangers hold cable and messenger together tightly with wide bearing surfaces which eliminate snaking and chafing. They are easily applied and make installations that are permanent and very neat



Reliable ELECTRIC COMPANY
OVER 30 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE · CHICAGO ILLINOIS

BULLETINS

data books, etc.

Copper Calculator (118)

General Electric has prepared a slide calculator to show at a glance how much copper can be saved in war plants by installing unit substations at the centers of load areas. The calculator uses a 1,000-kva, 4,160/480-volt unit substation as a basis, and shows the amount of secondary-cable copper needlessly wasted when the unit substation is at varying distances from the load center.

The reverse side of the rule carries a chart showing per cent increase in cable copper as the voltage is decreased and a chart giving the cable copper needed to carry a 1,000-kva load at various voltages over distances from 10 to 1,000 ft.

Square D Catalogue (119)

Lightweight devices designed primarily for aircraft and tank use but applicable to other portable or mobile equipment are described in "Air-Line", a new catalogue issued by Square D Co. Included are circuit breakers, switches, relays, contactors, push buttons, limit switches and other devices for 12-24-volt, d-c- applications.

Power Transformers (120)

"Power Transformers for Mercury-arc Rectifiers" is the title of a G-E bulletin describing interior and exterior construction details of the 6-phase and 12-phase oil-immersed units, self-cooled and water-cooled. These two units are typical of sizes both above and below 1,000 kw, the manufacturer states.

Induction Heating (121)

The Tocco process of induction heating is described in a booklet prepared by the Ohio Crankshaft Co. Applications in brazing, soldering and annealing are discussed and pictured and separate sections deal with various Tocco methods.

Solenoids (122)

Engineering data on two new laminated solenoids is given in a bulletin released by Dean W. Davis Co. According to the manufacturer these solenoids are designed particularly for hydraulic valves and general industrial purposes.

Industrial Lighting (123)

Industrial lighting units are the subject of a pamphlet, "Curtis Lighting for Vital Industry", recently published by Curtis Lighting, Inc. Emphasis is on the new Fluratex non-metallic reflector units and the silver mirrored glass reflector units for high bay installation.

Control Instruments (124)

Foxboro Co. has prepared a new catalogue describing its full line of measurement and control instruments. More than 200 illustrations are contained in the 48-page book which is divided into 10 sections for convenient reference.

Electric Etcher (125)

Electric etchers and markers are listed in a folder prepared by Ideal Commutator Dresser Co. Several models, including the new all purpose "Universal", are described and illustrated.

O-B Data Sheet (126)

Ohio Brass Co. has issued a data sheet on O-B line post insulators.

Fire Extinguisher Care (127)

Maintenance of portable fire extinguishers is covered in a pamphlet being distributed by the Pyrene Mfg. Co. Included are directions for inspecting and recharging extinguishers.

Cable Data (128)

Okonite is distributing a booklet giving specifications and selection data for wire and cable. Photographs, charts and tables accompany the descriptive material.

Switchgear (129)

Modern types of switchgear are described in a 20-page booklet released by Allis-Chalmers. Included are indoor and outdoor types with removable or fixed circuit breakers.

Selenium Rectifiers (130)

Selenium rectifiers are the subject of a bulletin prepared by the Benwood Linze Co. and covering assembly, plate sizes, efficiency, input voltage, stability, cooling and regulation. Illustrated.

ELECTRICAL WEST, 68 Post St., San Francisco, California.

Please send me information about the following CIRCLED items:

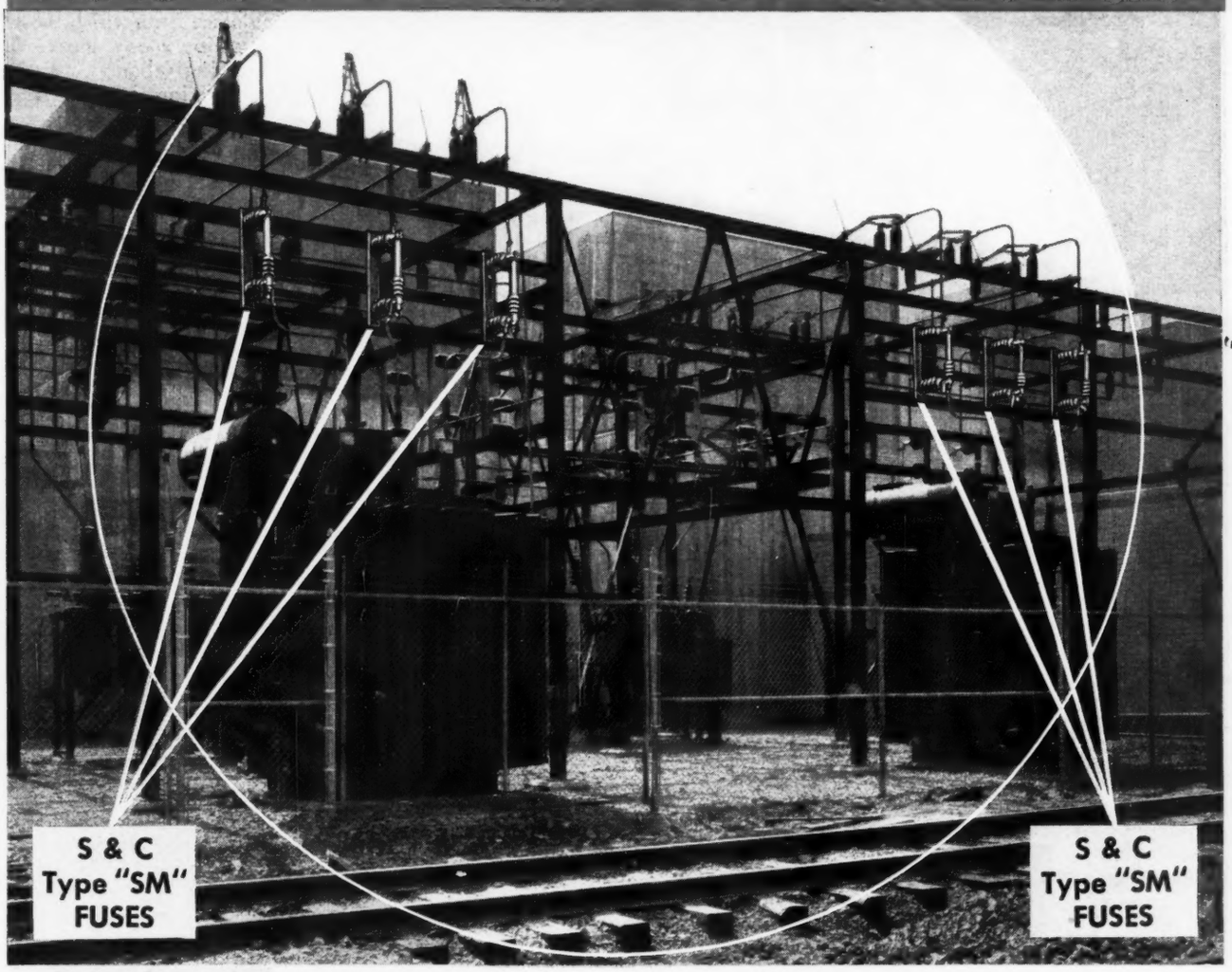
100	101	102	103	104	105	106	107	108	109
110	111	112	113	114	115	116	117	118	119
120	121	122	123	124	125	126	127	128	129
130									

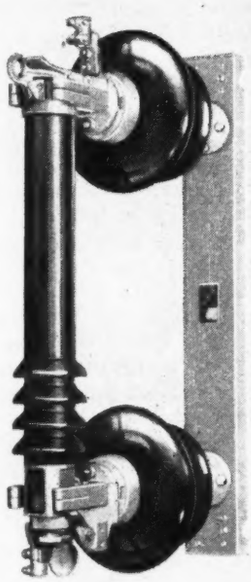
Name..... Company*..... Title*.....

Address .....

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

PRESENT DAY ENGINEERING PRACTICE DICTATES S & C FUSE PROTECTION





THE vital importance of military equipment production has emphasized the need for unusual care in the selection of power-supply protection because unnecessary interruptions mean serious production delays.

Present engineering practice has dictated the use of dependable S & C Type "SM" Fuses for many important installations. The photograph taken on the property of an aviation motor plant illustrates the small space they require while providing adequate protection. These Fuses are well known for their accuracy, high interrupting capacity, and reliability. They save space, installation time and labor, and their use results in great savings in critical metals. Early deliveries can be made.

Type "SM" Fuse ratings are from 1 to 400 amperes, with short circuit interrupting ratings up to 1,000,000 KVA. They are made for indoor or outdoor service for use on 2300/4000, 6600, 13,200, 22,000 and 33,000 volt circuits.

(Type SMG Fuses are available for 46KV to 138KV circuits)

SCHWEITZER & CONRAD, Inc.
4435 Ravenswood Avenue **Chicago, Illinois**

SHORT CIRCUIT-INTERRUPTING RATINGS IN R.M.S. AMPERES

Fuse Voltage Rating →		7,500	7,500	15,000	23,000	34,500
Circuit Voltage →		2,300/4,000	6,600	13,200	22,000	33,000
Type and Size of Holder	**SMPC-4	17,500	15,000	12,500	10,000	7,500
	SMP-4	27,500	25,000	20,000	15,000	10,000
	**SMPC-5	30,000	25,000	20,000	17,500	15,000
	SMP-5	40,000	35,000	30,000	25,000	20,000

**Equipped with Condenser

TYPE "SM" POWER FUSES

WESTERN REPRESENTATIVES:

SAN FRANCISCO
George E. Honn, 420 Market Street
LOS ANGELES
Farnham & Cunningham, Edison Bldg.
SEATTLE
T. S. Wood, 220 Ninth Avenue, North
SALT LAKE CITY
Riter Engineering Co., Kearns Bldg.

ELECTRA'S HUSBAND

New Year's Resolutions

BECAUSE it was getting near that time, Electra and I were talking about New Year's resolutions. We do every year, and it seems I always come out skinned up from a bad ribbing.

"Well, what are you going to resolve?" Electra asked. "The usual things I suppose—no more than two cocktails, to hang up your clothes at night, not to get water all over the bathroom floor when you take a shower, and not to take it out on Junior when you've had a bad day at the office."

"That stuff is out for the duration," I countered. "It doesn't make any difference anyway. We ought to resolve to do something about getting the war over with in a hurry. We can stop peddling rumors. We can buy more War Bonds if we can scrape enough together to pay income taxes. We can stop being amateur strategists. I haven't thought much about it, but there are plenty of things."

"Your trouble is that you're not mad enough," Electra said. "One of the gals went up to Seattle recently. She sent me something to read that her daughter brought home from the Boeing plant, where they make the Flying Fortresses. One of their engineers has been out on the fighting fronts for almost a year teaching the boys how to maintain the planes. George MacDonald his name is. He just came home and he isn't very happy about what he found. You ought to read what he says. Then see that a lot of your friends do the same. It will give you ideas on resolutions."

She passed me the piece that follows.

"YOU probably won't like what I've got to say. You may pass it off as the grumblings of a crank or a fellow who is emotionally upset.

"Well, all right, I am upset. I think I have a right to be. I am disappointed in the mental attitude of Americans toward this war.

"Primarily, I think what ails Americans is that they still don't really know what a war is. Oh, that's been said before, to the point of weariness, but the fact remains. It is very apparent to one who has just returned from actual war zones.

"One of our biggest weaknesses, I believe, lies in our belief that we can win the war by ballyhoo. If war production is up 300 per cent since Pearl Harbor, we all pat one another on the back, as if that were all that is necessary.

"Of course it is just dandy that production is up 300 per cent or 400 per cent. It wouldn't be too much if it were up 1,000 per cent. But the stuff is no good to us or our allies until it's on the warfronts, and the men are there to put it in use, and the parts are there to keep it in use.

"In Egypt I've seen mechanics sweating over a plane in 130-deg. heat until some of them have cracked and run blindly around until they dropped. I come home and I find comfortably clothed American workers complaining because the factory is too stuffy some days, or it isn't up to room temperature and they have to wear a sweater.

"In India and Burma and China and the Near East, I've seen these same mechanics work until they were ready to drop over from fatigue—and I come home to discover that even with a six-day week, American plants have absentee records that run from 8 per cent a day to as high as 25 or 30 per cent weekends.

"I've seen aircraft mechanics in the Far East working on improvised fields with baling wire equipment and a single drill to patch up a bullet-riddled plane. If that one drill broke, they were out of luck. I've come home and I see posters urging mechanics to be more careful because they average 3,185 broken drills a day. Knowing that steel drills are critical war material, how would you like to show that poster to the one-drill mechanic in India?

"Many of the men I met in China and Burma and the other warfronts were highly skilled mechanics who had voluntarily given up good paying jobs for Army pay and the excellent chance of being killed, all because they want to win this war. When I come home, I find men whose big concern is not how much war materials they can get out, but how soon they're going to get a higher rating in the factory or shipyard or the Army office from which they happen to be drawing a pay check. I see business haggling about profits and labor unions walking out over jurisdictional disputes.

"Now I hear indignant squawks about high prices and rising rents and the need for keeping a family in food and clothing. Listen, brother—and sister—ask the people in the war zones about 'high prices.' Ask them about food and clothing and a place to live.

"I hear the protests, too, at this point of the business men who still think in terms of paying more dividends or of keeping whatever degree of monopoly they enjoy in a particular manufacturing field. I wish I could introduce them to the fruit peddler in Palestine who used to be a multi-millionaire manufacturer. His worries about dividends and leading position in his field have been taken over by the Nazis—and you know how the Nazis pay off.

"That's my answer, too, to the men who have come around to me and asked how they could get into the engineering service unit to work abroad. Why? Because 'you fellows make more money!'

"When we lay all night in a muddy ditch during a bombing attack, we were not worrying about how much money we made. You don't think in terms of dollars, either, while you're dragging broken, screaming men from the burning wreckage of a bomber—when you see a fellow you knew wild with pain, running a hundred yards on legs so smashed that the bones protrude—when a family you stayed with is later overtaken by the enemy and bayoneted—and a lot worse things I could tell.

"You'd be surprised how unimportant profits, and pay rates, and coffee and tire rationing can become when you hear your own American boys crying with rage because their bomber is grounded for lack of spare parts and they haven't any way to get at the - - - - - - - - - - - - - - - who are responsible for all this.

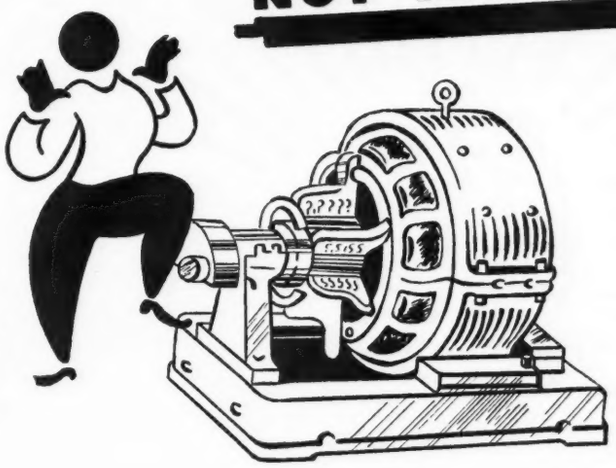
"Yes, you would be surprised. I had a chance to find out how Americans are thinking and acting, because I came back to the States by way of Florida, and I traveled clear across the country to get home. From one side of the country to the other, the attitude is the same. That's why I am so disappointed.

"I think we can win this war, but not until we dig in more earnestly and more unselfishly than we're doing now."

SO Electra and I are going to resolve to do our part. How about the rest of you?

Junk!?

NOT THIS YEAR



WRECKED MOTOR WAS BACK ON THE JOB IN 24 DAYS

LARGE MOTOR LITERALLY WRECKED BY OVERSPEEDING. IN NORMAL TIMES IT WOULD HAVE BEEN JUNKED AS SCRAP METAL. BUT IN THIS WARTIME YEAR DELAY IN GETTING NEW ONE WOULD HAVE MEANT SLOWDOWN IN STEEL MILL PRODUCTION. WRECKED MOTOR RUSHED TO NEAREST WESTINGHOUSE MANUFACTURING & REPAIR PLANT...COMPLETELY REBUILT...TESTED...WAS BACK ON THE JOB IN 24 DAYS! BACK ON THE JOB...SUPPLYING UNCLE SAM WITH FIGHTING METAL.

Westinghouse
MANUFACTURING AND REPAIR

J-90455

IF THE EQUIPMENT NEEDING REPAIR IS VITAL TO THE WAR EFFORT . . . PHONE THE NEAREST OFFICE OF WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY FOR

EMERGENCY SERVICE

33 M & R PLANTS . . . ONE NEAR YOU!

A CENTURY OF SERVICE

When, at midnight on December 31st the clock chimes twelve, and we pass into the year 1943, so Hubbard and Company will enter its second century in business. We think it is excusable to believe that such survival and notable growth could only be possible for an institution built on solid foundations with a steadfast policy of honest service in all its ten decades of existence.

That past generations of "Hubbard" men have done a splendid job is attested by the Present. We owe all to their courage, devotion and inspiration. We of the Present cannot rest on their laurels. We must turn our eyes to the Future.

On this, the advent of our "century in business," we thank you, our friends, for your ever loyal support and pledge that we of the Present "Hubbard" generation will keep faith with our predecessors of the past 100 years.

May our wishes for your Peace and Happiness bear fruit in 1943. Sincerely and Gratefully,

HUBBARD & COMPANY

ELECTRICAL WEST

JANUARY, 1943
VOL. 90 NO. 1

It's Hard To Say "No"

IT'S hard to say "no" to a customer. It's so hard, in fact, that few people can do it continuously without defensively getting mad at themselves for doing so and at the customer for forcing it on them. Yet never has it been required to say "no" so much as it is these days. For a nation, raised on the ideal of giving superservice with a smile, it has been one of the horrors of war, this denying everyone everything.

Bankers and purchasing agents, such nice people to meet socially, have earned their unenviable reputations because they had "no" jobs to perform. Utility personnel have won back public confidence because of late years they have been able to say "yes" and be helpful to customers, whereas in earlier days of too rapid expansion of demand and not rapid enough growth of facilities they had to say "no" too often. Now the war has forced them to deny almost everything their customers want and plead for, and unless fortified with reasons for their "no" answers, they are in danger of a major collapse of hard-won public goodwill.

Impressed on every hand by the breakdown of service and the grumbling, ill-tempered and insolent treatment from employees of trains, cabs, stores and restaurants, R. E. Fisher, vice-president in charge of public relations and sales of Pacific Gas and Electric Co., set in motion the machinery to prepare the public contact employees of his company to meet the unusual and negative impacts of the war situation by a training program to maintain public relations under wartime conditions.

He realized that under priority restrictions new customers cannot be served and old ones must be turned down on many of their requests for added facilities. The red tape surrounding every piece of business baffles them and they are likely to think they are being mistreated by the utility without realizing that it is the war itself that is to blame. He felt that counter personnel and public contact employees, unless they were properly instructed as to the reasons why for all of the things they had to deny their customers, would be at a disadvantage and inclined to pass the buck to company rules, the government or, in self defense, angrily declare it was none of their business.

With a company scattered over such a wide territory the problem of instructing the personnel was no mean one. Organization of this was turned over to O. R. Doerr, general sales manager, and to Bert Reynolds, manager of domestic sales, who developed the program and procedure. It was decided to hold first a "normal school" to train leaders from each of the divisions who, in turn, would set up training programs of a similar character in each division to reach all public contact employees.

The first school was held Oct. 15 and 16 at the company headquarters, 245 Market St., San Francisco, in an all day and a half day session. The "normal school" group consisted of from three to six or more members from each division. The local training program was placed on the shoulders of one of the men who attended this central school.

The local training programs were set up for three different sessions. The first and second sessions the counter clerks, salesmen, the superintendents, the district agents and the estimators were required to attend. To the third session were added the service men.

In making up the program for the training course, it developed that most of the time would be devoted to explanations and interpretations of the various regulations and restrictions required by the government. The reason for this is well expressed in the opening remarks by Doerr:

"The fact that we are the agency which must deny or restrict the customers from some of the desired uses of our services makes us directly vulnerable to their displeasures and criticisms. For this very reason our job today calls

FIRST SESSION

1.	Introduction Purpose of the school	Doerr	15 min.
2.	The P-46 order		
	(a) Its purpose and scope	Martin	20 min.
	(b) Details of its operation (temp. power)	Jones	25 min.
	(c) Service to war housing and L-41 order	Hill	45 min.
		Recess	5 min.
	(d) Administrative letter No. 3 USDA and miscellaneous	Stryker	60 min.
		Noon	

SECOND SESSION

3.	The L-31 and L-174 orders		
	(a) Domestic	Stryker	30 min.
	(b) Commercial and industrial business	Gumz	20 min.
4.	Wartime restrictions and procedures governing commercial and industrial business		
	(a) Commercial (b) Industrial (c) Military	Gumz	20 min.
5.	Priorities situation on lamps		
	(a) Mazda (b) Fluorescent (c) Luminline (d) Blackout lamps	G. E. Carlson	15 min.
		Recess	5 min.
6.	The appliance situation (Mention the 14 priority orders restricting and controlling)	Reynolds	45 min.
7.	Regulation W governing financing and the price control regulations governing ceiling prices on appliances	W. W. Clark	15 min.
		Adjournment First Day	

THIRD SESSION

8.	Farm electric equipment repair procedure	Christianson	30 min.
9.	Rates, emergency rules and regulations, bi-monthly billing, etc.	Sutherland	30 min.
10.	Wartime handling of various service requests		
	(a) Unlocks, meter sets, etc. (b) No-light or no-power service calls (c) Selective service on gas and electric appliance servicing (d) Requests to light pilots (e) Appointments and "C.G.I." callbacks (f) High bill complaints and meter testing	Naylor	60 min.
		Recess	5 min.
11.	Maintaining public relations—"How to say 'no' with a smile"	Ray	10 min
12.	What to do when you return to your division	Doerr	30 min.
13.	Our wartime job	R. E. Fisher	
		Adjournment	

for more tactful handling of customer contacts than is the case under normal conditions.

"No argument is needed to make the point that one of the foremost principles of dealing agreeably with people, even though their requests in some cases may have to be denied, is to be informed and equipped to answer their inquiries and demands. Only when you have the facts can you bring about understanding on the part of your listener. Of course, it is taken for granted that the proper attitude when imparting information is necessary also in creating favorable listener reaction.

"Suffice it to say, one should know what he is talking about and when it comes to knowing all the facts and answers regarding the numerous governmental restrictions which are now a part of our daily lives in the utility business, it is almost an impossible task. It is necessary, nevertheless, that we know all we can, at least a great deal more than the public, and, as to the rest, know where the answers can be had. Most of the next two days will be spent on a review of the detailed information and many facts pertaining to certain wartime laws, regulations and restrictions, all of which we should know to deal successfully with our customers.

"Our public relations problem is only aggravated when, due to lack of knowledge of the facts, customers are told 'no' when the answer should be 'yes.' Certainly we have to deny often enough and when the response is erroneously given and later reversed, the reaction, you can well understand, is doubly hurtful."

He cited cases in which shipyard workers had lost a day's work to come to San Francisco headquarters to appeal for service which, under all regulations, could have been granted them in the division. Numerous customers, he told them, had traveled distances as far as 100 mi. to endeavor to obtain gas or electric service under provisions of P-46 when service could have been rendered under its provisions had the local people known the right procedure.

Pacific Gas and Electric Co. has set up a priority committee in the general office headed by D. G. Martin, general auditor of the company. This committee is composed of heads of all departments. It studies the regulations, interprets them in light of the company's operations, and issues digests to its divisions. It was to make this information percolate down to the counter clerks, service men, estimators, that the course was designed. Therefore it was appropriate that Martin open the school after its purpose had been told.

The program itself may be of interest. It is printed on this page.

At the conclusion a book or folder was made up for each person attending to be kept as a reference. The questions and answers brought forth at the preliminary or normal school meeting had been mimeographed to serve as a guide for handling of similar questions as they might arise in the divisions. This book also served as a text for those conducting the local classes.

Upon their return from the "normal school" meetings, arrangements were made with each division manager to lay out a program for imparting the same information to the public contact employees in every one of the offices of the company. With the subject matter well outlined the individual organization of classes in the various divisions and the interpolation of information to fit local conditions was left up to the division personnel. Rubber rationing and gasoline rationing presented a problem but it was surmounted by individual planning.

Procedure to keep all employees informed of changes in the regulations as they are issued was also emphasized as a responsibility which each division must organize itself to handle. From the company's priority committee these changes are being sent to the key personnel but it is the latter's job to transmit the information regarding changes to those affected in their divisions.

One of the important aspects of the entire program was the delegation of responsibility for maintaining good public relations during the crisis to all those who attended. It was a challenge to their initiative and tact and their resourcefulness in keeping up to date with the complications which change from day to day.

One sentence from the closing remarks of Fisher expressed the entire purpose:

"People can take it, but they like it with a smile. We have got to be courteous even though we have to say 'no.'"

Power—Giant Arm of Production

Ninety Per Cent of American Industry Is Electrified

ELECTRICITY is the mainspring that turns the wheels of our factories, mills and mines. It is the tireless arm that grinds our grain, weaves our cloth, pumps our water, builds our planes, our guns, our ships, our cars, our trucks and tanks . . .

The mighty Pharaohs had less energy at their disposal in building their pyramids than is generated today by one single power plant. The combined capacity of America's central power systems is without parallel in the history of the world . . . 46 million kilowatts, i.e., 65 million horsepower in steam turbines, hydro turbines and other prime movers. That is more power, day in and day out, than 650 million slaves could produce—for a limited time—minutes in fact.

The capacity of this vast fountain of energy is beyond the grasp of the average man who flips a switch and sets in motion machines that perform the labor of a thousand man-hours in a matter of minutes. Perhaps only the old time farmer, whose traditional source of power is a team of tired horses and a pair of calloused hands, knows how to appreciate this commodity that is so vital an ingredient of everything we consume and use.

Yes, we take electricity for granted. We expect it to appear in unlimited quantities, like water and air, as we need it. Almost as essential as these two elements in times of peace, it becomes a matter of life and death in times of war. Industry would collapse without it and the nation would quickly perish.

With the catastrophe of Pearl Harbor a little over a year ago, came the realization that we had to outproduce our enemies. To out-produce our enemies, who had a seven year head start, meant to turn more wheels than they were turning and to turn them faster than they were turning them.

New plants sprung up overnight. Production increased beyond our wildest dreams. Aircraft and shipbuilding surpassed the most daring forecasts. The machine tool industry's output grew to a volume that bordered on the miraculous. Guns, shells, uniforms, shoes, tanks and a thousand other items were being made in hitherto undreamed of quantities. All of them have one common essential ingredient – power. Industry demanded power – more and more power!

It is no small tribute to the power industry that, while other raw materials developed shortages necessitating strict priorities control, electricity remains unrationed – no priorities, no curtailments, no rate increase. Current industrial consumption is running 16 per cent over 1941 and 50 per cent over 1940. Not spectacular perhaps but when we consider that the nation's 26 million domestic consumers utilize only about 14 per cent of the energy output, we begin to get some idea of industry's power consumption.

Our power companies might have been stunned by the prospect of mounting demands for kilowatts. Instead they set about developing and coordinating a multiplicity of relatively small and seemingly unrelated factors. Individually or even collectively, these have not been of a spectacular nature. Certainly they have not inspired the award of the Army-Navy E although they are an essential ingredient in every Army-Navy E that has been awarded to American industry.

The contribution of the power industry to the winning of the war is not likely to flame forth in newspaper headlines. It takes the more prosaic turn of portraying an industry that is doing wonders quietly, unobtrusively.

At the close of the last war the power at the disposal of the American industrial worker averaged 3⅓ horsepower. At the beginning of this war, twenty years later,

This is the seventh of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers, and in daily newspapers in New York, Chicago and Washington, D. C. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

it had increased to 6½ horsepower. What other nation can even approach that figure? This large provision of power is the achievement of the electric utility industry. For years it had built and applied its equipment to the highest standards of performance and operated its systems to equally high standards of service and dependability. Always recognizing that "public service is a public trust" it had maintained wide margins of security in performance. Today these margins are the source of the power industry's ability to rise to the emergency.

In short, the electric utilities were prepared!

Power men are accustomed to looking ahead, to prepare for growing loads and allow for unforeseen contingencies, for electricity cannot be stored. It is "ordered" by touching a switch. It is delivered and consumed at the same moment.

Months before the actual outbreak of hostilities foresighted power men set to work computing how much life of equipment could be risked in the process of crowding it toward greater output. Generators, boilers, turbines, cables, transformers and even conductors underwent close scrutiny in an effort to increase the load – *safely*. They figured, they experimented, they tried untried measures.

Insulation, for example, is the crux – the least known component of electrical apparatus. When it lets go the service suffers. It is not easy to know how near any bit of crucial insulation is to letting go. It takes courage to work it to a point just short of failure . . . but that is exactly what is being done today.

Technological forcing of equipment, however, is not all of the story. Obsolescent equipment has been rehabilitated; salvage has been intensified; critical metals have been replaced by non-critical materials; water sprays, air-blowers and other cooling methods have been installed to keep over-loaded apparatus from over-heating. Nothing has been overlooked. Ingenuity has contrived the well nigh impossible.

Hand in hand with these measures of expediency have gone measures of intensification. Hydrogen pressure for cooling generators has been stepped up from ounces to pounds taking more heat away from the machines and enabling them to carry greater loads. Capacitors – little more than aluminum foil interleaved with thin paper – have been applied by the carload relieving the systems of that mysterious reactive current which is associated with that equally mysterious power factor. They have performed wonders in avoiding the need for additional generating and transforming equipment. The use of portable sub-stations has averted the otherwise necessary reserve capacity in fixed installations at many points.

When coal was placed on the urgent list last spring the electric utilities outstripped all other industries in providing storage for the winter. Stocks on hand the first of October were sufficient for 105 days, or more than twice what would be considered adequate in times of peace.

When staff losses to the armed forces became serious power companies contrived measures that enable them to get along without aggravating the national manpower situation by hiring others to replace them. Today meters are being read every two or three months instead of monthly; women are being trained to do drafting, keep the logs in power plants and sub-stations and to test meters in shops and laboratories.

On the summit of "Grandpa's Knob", a mountain overlooking Rutland, Vermont, stands a giant windmill that would have been the delight of Don Quixote. Towering 200 feet above the tree tops its mighty 175 foot propeller turns with the wind and drives a 1,000 kilowatt generator which feeds its output into the Central Vermont Public Service Corporation's power system. The most ambitious wind-turbine generator in the world, and a daring experiment of forward-looking men.

Today everything electrical is being tried; is being worked harder than it has ever been worked before.

Great credit is due the men behind the electric power industry. These men have recognized the responsibility of their jobs – it is a part of their very being. Theirs is the kind of service that *must* be maintained. No soldier is truer to his trust than is the employee of this great industry.

The service must go on! No matter what happens – acts of God or deeds of men – the service must go on! Labor disturbances may disrupt other industries but there have been no shutdowns due to labor trouble in electric power plants since Pearl Harbor.

And this winter when blizzards pile up drifts and sleet makes pavements slippery there may be absenteeism from other plants but the utility employees will be on the job ready to climb the ice-covered poles and repair the ice-laden lines whenever the call comes.

In this war the least costly yet the most precious element of production – electricity – will be ever ready to "man" the machines that will produce the weapons that will give victory to the forces of freedom.

President, McGraw-Hill Publishing Company, Inc.

Synthetic Rubber Processes II

A review of the U. S. rubber situation with specific reference to steps being taken to produce synthetics, a study of synthetic characteristics and a discussion of processes in terms of electrical and steam demands

Donald R. Jenkins
Westinghouse Electric & Manufacturing Co.

MUCH of the synthetic rubber to be produced will come from plants employing the co-polymerization process wherein butadiene and styrene are combined to form Buna S. As explained in Part I, this synthetic product closely resembles natural rubber and has the added advantage in that it can be worked in the same machines formerly used for natural rubber. It is this process which is being developed in southern California.

Steam and electrical requirements of synthetic rubber manufacture vary depending upon the process employed. In the East and Middle West, several of the large butadiene and styrene manufacturers will produce electrical power as a by-product of the generated process steam.

One process utilizing coal as a base for butadiene will require approximately 1,400,000 lb. per hr. of steam in an 80,000-ton per year plant. The turbine to be used in this installation will be of the super-imposed type and utilize the steam at 725 psi, 750° F. and will exhaust into the process steam header at 165 psi. Steam at 725 psi and 750° F. will be employed because at that pressure and temperature the use of critical materials is held to a minimum. The exhaust steam will be used for some of the processes at 165 psi and also for a number of mechanical-drive turbines exhausting at 25 psi for further process use.

The first part of this article was published in December, page 42

The southern California synthetic rubber program differs from the program in the East and Middle West in that super-imposed turbines to obtain electric power and reduce the pressure of the process steam will not be used. This arrangement can only be utilized advantageously where the excess power is marketed and where the chemical and the co-polymerization plants are located together.

From information published in October, it is indicated that the Shell Chemical Co. and the Southern California Gas Co. will produce butadiene in southern California.

Butadiene may be made by the "quick" process, which requires only 10 or 15% additional equipment to existing refining plants to convert them for butadiene production. At the present time, one large oil company in southern California is being considered for this change. The production of butadiene by the "quick" process is expensive and will probably be discontinued when the regular butadiene plants reach full production.

The Southern California Gas Co. will supply butylene to the Shell Chemical Co. to be processed into butadiene. The gas will be made in regular gas generators using diesel oil or a lighter oil

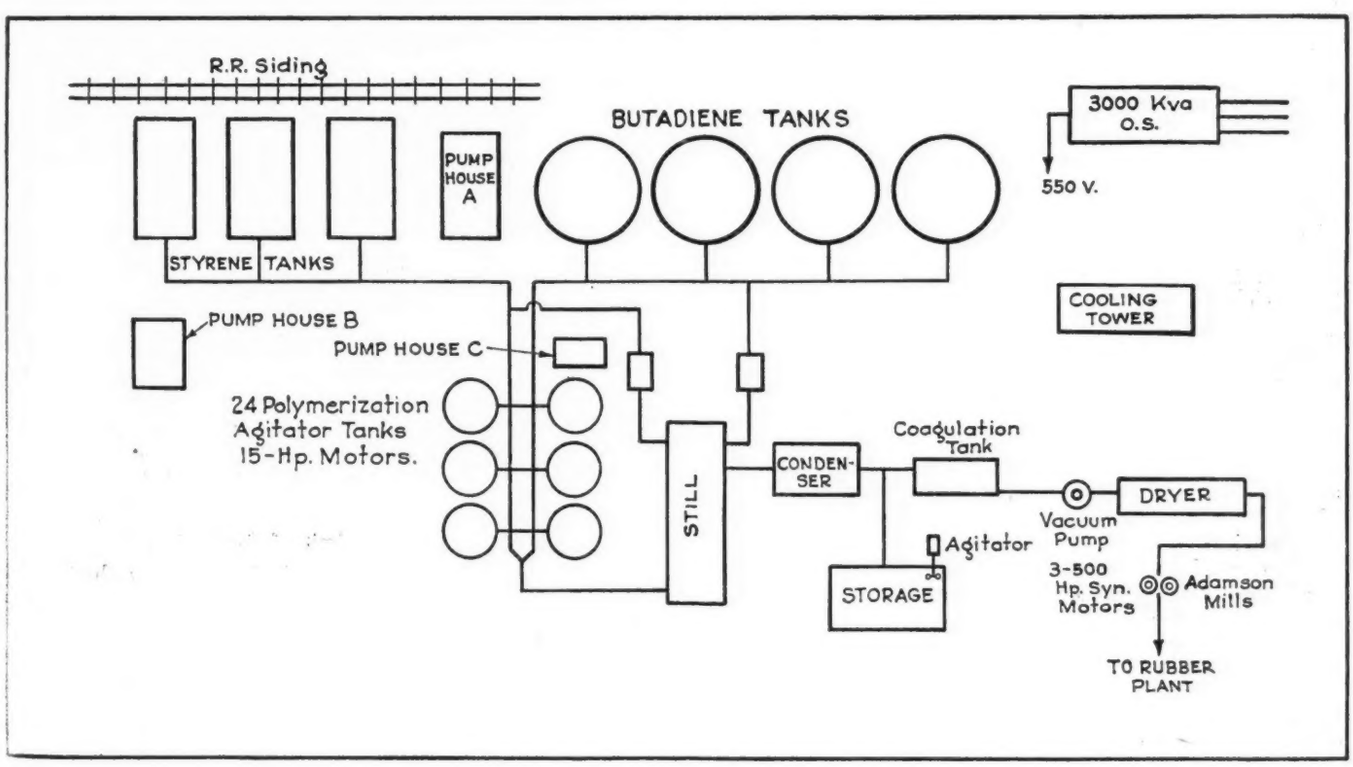


Fig. 4—Schematic layout of a complete synthetic rubber process installation

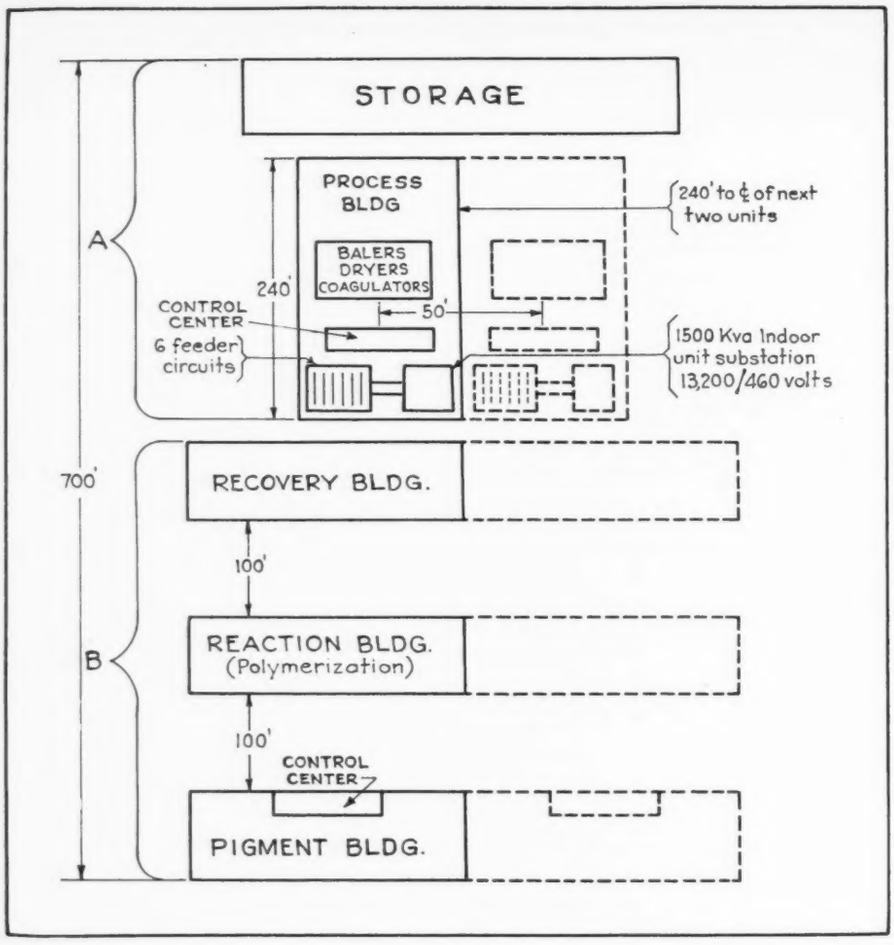


Fig. 5—Schematic representation of a 15,000-ton synthetic rubber unit plant

such as naphtha. The temperatures to be used will be lower than usual, giving a higher heat content to the gas. The oil used will have a flash point of 40° F. and by the Engler ASTM method, the end point will be 476° F.

The gas will be pumped into the process plant at a pressure of 185 psi at the rate of 48,000,000 cu. ft. per 24 hours. The process plant is very similar to that of a gasoline refinery and will yield 90,000 gal. of gasoline and 70,000 gal. of butanes per 24 hours. The balance of the gas not used will go into the gas mains. The butanes will go to a separating and refining plant and will be pumped via pipe lines to the butadiene plant.

The butylene production will use 500,000 lb. per hr. of 160 psi steam. Exclusive of lighting the electric power load will be approximately 2,500 kw.

The styrene plant proposed for the southern California area will use 240,000 lb. per hr. of steam and 2,600 kw. of electrical energy. The butadiene production plant will use 370,000 lb. per hr. of steam and 1,400 kw. of energy. One rubber company in the area will use 50,000 lb. per hr. of steam and 3,200 kw. electrical energy.

Plans are under way by the four large rubber companies—Goodyear, U. S. Rubber, Goodrich, and Firestone—to establish polymerizing plants in various sections of the country. Some of the plants will be located near the sources of petroleum such as the southern California and Texas areas. The styrene plant in the southern California area will be operated by one of the major chemical companies.

The electrical equipment to be used in the butadiene and styrene plants is limited because of the wide use of mechanical-driven steam turbines as a means of utilizing the pressure drop for the process steam. In contrast to this, the co-polymerization plant is fully electrified.

Fig. 4 and 5 show approximate layouts of the butadiene and styrene plants with the co-polymerization plant combined. Fig. 4 is a schematic layout of a complete synthetic rubber process plant as originally proposed. Fig. 5 is merely a graphical representation of a 15,000-ton unit; these units are called "trains" and as originally planned are being built by one manufacturing company. The synthetic rubber plant capacities will be in multiples of these 15,000-ton "trains."

Fig. 6 shows a one line diagram of the proposed electrical equipment to be used in each 15,000-ton co-polymerization unit. The list of equipment follows:

Two 1,000-kva., indoor-type, unit substations comprising a 3-phase Inerteen transformer stepping down the supply voltage to 440 volts, a disconnect switch interlocked with secondary breaker, one main secondary, 1,600-amp. 440-volt breaker, 50,000-amp. interrupting capacity, a total of nine main feeder circuit breakers, 25,000-amp. interrupting capacity, one air-type tie breaker, 1,000 amp., 50,000-amp. interrupting capacity between each substation.

200—440-volt, 3-phase, 60- or 50-cycle motors from 1/3 hp. to 75 hp., 2 and 4 and 6 pole, about half the number to be explosion-proof.

200—Control centers, some located on motors from 1/3 hp. to 75 hp., 2 and some on the second floor of the pigment building, equipped with overload and low voltage protection.

200—Pushbutton and selector switches. Lighting equipment for the plants, including dry-type transformers.

Each installation will vary depending upon local conditions and changes which undoubtedly must be made in the proposed plans.

Rubber from Other Products

Much has been said about obtaining rubber from other substances, particularly guayule. This is a small shrub that thrives best if a heavy rainfall is followed by a protracted dry spell. Mexico and the Southwestern United States are thus suited to its growth. Guayule contains about 19% resin, which is an undesirable property, making processing difficult. However, rubber obtained from guayule is identical to the natural rubber. A few thousand tons will be available annually from Mexico and plans are now under way to have 180,000 acres of guayule under cultivation by 1944. Full production will not be obtained until after about five years of careful cultivation. At the present time the government has undertaken the planting of this shrub in the Salinas valley and near Indio, Calif.

Limit of Synthetic Rubber

The possibilities of the synthetic rubbers are almost limitless. According to some statements over 6,000 co-polymers have already been tried with butadiene. Much has been learned about natural rubber in the last 25 years and undoubtedly much will be learned about synthetics in the future. Synthetic rub-

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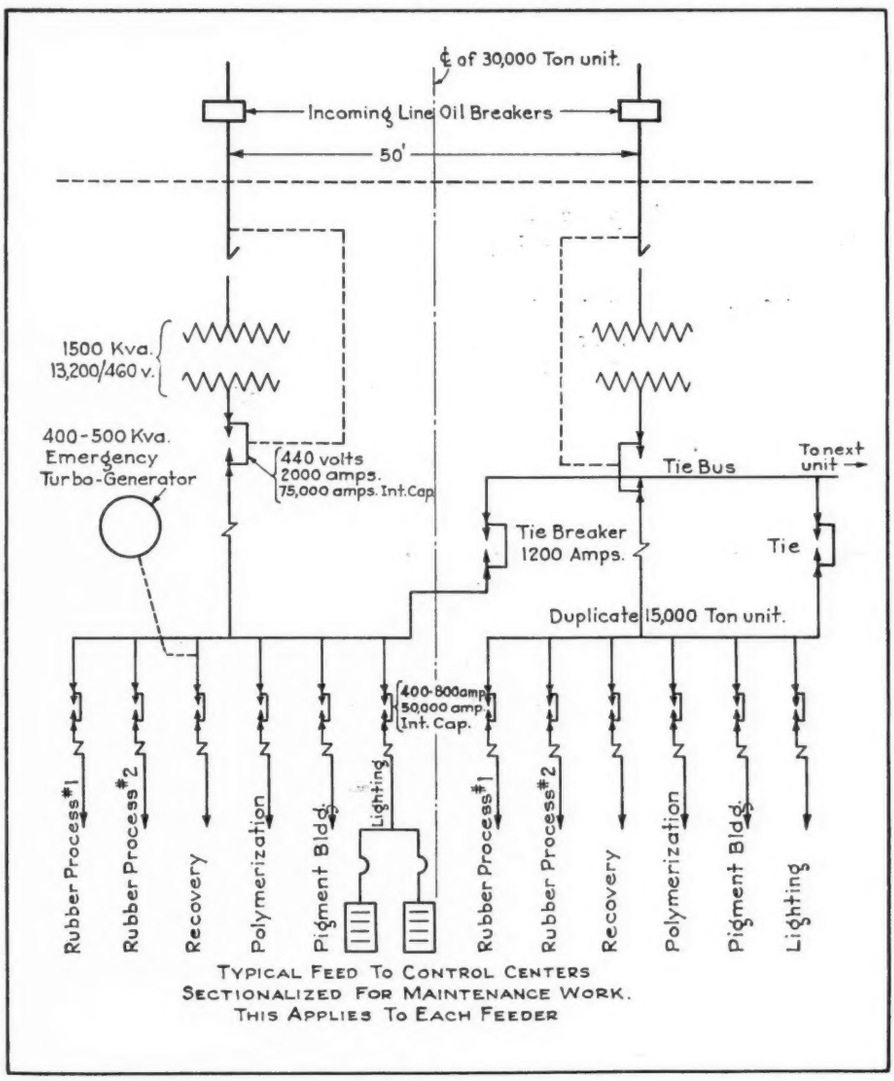
bers can be developed to fit each individual application.

The automotive industry with its large demand for rubber may some day use synthetics for all of its rubber requirements. This demand will be supplemental to the use of synthetic rubber in the electrical field, for waterproof clothing, in the printing industry, for belting, etc., but it must not be overlooked that the use of synthetic or natural rubbers will be dependent upon the degree with which they can be compounded.

When the war is over and normal activities are resumed, much of the research and development now directed to war uses will be utilized for peacetime applications of synthetic rubber.

It must be remembered that all of the synthetic rubber plants are owned by the government and only operated by private industry. This fact may have a large influence determining to what extent synthetic rubber will be used after the war.

Fig. 6—One line diagram of electrical layout of proposed 15,000-ton plant



Electric Fish Screen Saves Steel

Truckee River installation replaces mechanical fish screen saving 33,000 lb. of steel and cutting costs

T. J. Welsh
Assistant engineer, Sierra Pacific Power Co.

SIERRA Pacific Power Co. has just recently completed the installation of an electric fish screen, located at the intake to its canal supplying 500 cfs of water to the Farad hydroelectric plant on the Truckee River near Floriston, Calif.

The new installation replaced an old mechanical screen which was installed at considerable expense in 1931. As shown by the accompanying photograph, it consisted of panels made up of steel bars ¼ in. x 2½ in. x 19.7 ft. long, spaced ½ in. between bars. These panels, of which there were 16 in number, were each about 3 ft. in width and were placed on an incline with the canal bottom. They were supported by a wooden, steel and concrete structure. Since its installation, considerable trouble and expense were constantly experienced due to the collection of debris which reduced the flow of water to the plant. During freezing weather, the panels had to be removed by use of a travelling chain block attached to an eye-beam mounted on a wooden frame just below the steel racks. As soon as the weather permitted, it was necessary to again replace the bars to prevent the fish life from entering the canal. Approximately 35,000 lb. of steel was used in this installation and the cost was $6,206.

The new screen consists of swinging electrodes which were mounted on a support attached to the downstream side of the old wooden frame-work. Ordinarily, in an installation of this kind, the electrodes would be suspended from a catenary supported by structures mounted on each side of the canal, but in this instance, use was made of an existing structure which had previously been used in connection with the removal of the rack panel sections of the old mechanical screen. The electrodes consist of ⅜ in. dia. galvanized pipes, 12 ft. long, spaced on 3 in. centers. These electrodes are attached to a pipe support (1¼ in. dia.) by use of flexible steel ropes and are adjustable so that the electrodes may be set to clear the bottom of the canal. The flexibility of the electrodes allows all types of stream-carrying debris to pass through without obstructing the flow of water.

Development Follows Research

The screen installed is known as the Burkey electric fish screen. It is the result of years of research and development by Henry T. Burkey of Hollywood, Calif. During the years of research and development, many obstacles were encountered—for instance, the problem of diverting a 2-in. fish and a 2-ft. fish swimming side by side into the electrified area. It was found that ordinary electric current strong enough to divert one fish, would stun or kill another size. Extensive research in the physiological field resulted in the de-

velopment of a special current wave possessing certain characteristics which caused unpleasant stimuli to fish, but did not produce physiological tetanus (a gripping of the muscles) which would render them helpless. This type of current wave did not injure them in any way. It was then possible effectively to stop or divert all sizes of fish simultaneously without stunning or killing them. Furthermore, this type of current wave was not injurious to human life.

Construction Data

The Burkey electric fish screen consists of three simple parts:

1. The electronic impulse generator, employing industrial type vacuum tubes and operating without moving parts, is a self-contained unit which may be installed in a building or housed in a weather-proof cabinet. Current can be supplied to these generators from any light socket, or small lighting unit, or water wheel driven generator, thus adapting the device to existing condition at any location. The generators are economical and efficient and a minimum of attention is required to keep them in operation. Output voltage, as well as frequency of impulses, is easily adjusted, as the controls are mounted on the panel of the unit.

2. The live electrodes, suspended to swing freely from an overhead support.

3. A suitable ground to complete the circuit through the water, thereby creating the electrified zone of water, which is known as the electric fish screen. In the Sierra Pacific Power Co. installation, the ground conductor consisted of placing a pipe, 1¼ in. in diameter, on the bottom of the canal across the full width of the channel. It was placed about 3 ft. upstream from the plane of the live electrodes. Another ground of similar material was placed about 5 ft. above the channel bottom and about 2 ft. upstream from the electrodes. This was to insure a good distribution of the current passing through the electrified zone.

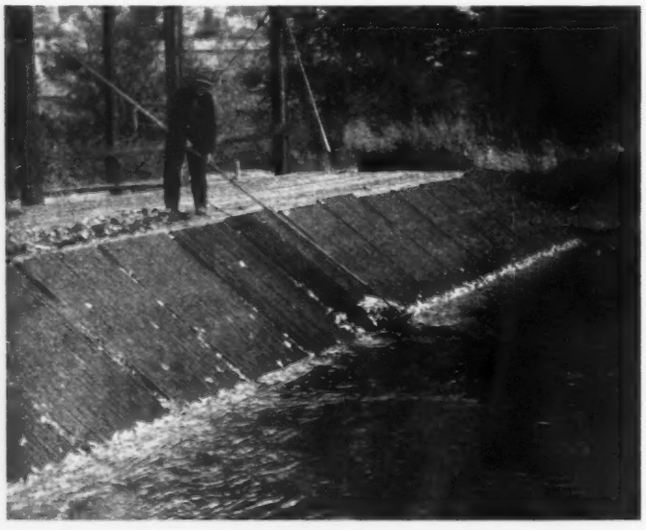
This new electric fish screen keeps game fish out of the ditch supplying water to the Farad Plant of the Sierra Pacific Power Co. on the Truckee River

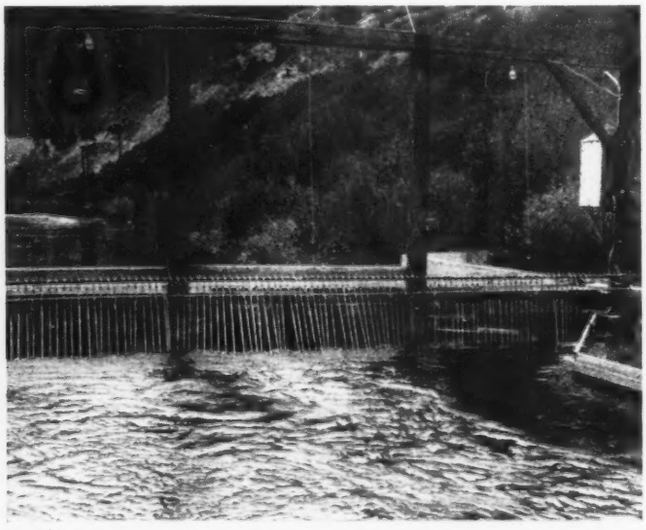
To insure constant operation of the screen, a telemeter is connected to the impulse generator and to a nearby power company telephone circuit, which is checked every half hour by the operator stationed at the Farad power plant, located 1.8 miles downstream from the screen. The operator simply lifts the telephone receiver, and if the screen is in operation he can hear the sounds made by the impulse generator at regular intervals.

Metal Saving Great

It might be interesting to note that while the old screen contained approximately 35,000 lb. of metal, that used in the new installation does not exceed 2,000 lb. The maintenance cost of the old screen was also very high while the cost of operating the new screen is practically negligible. The new screen has been in continuous operation since Aug. 10, 1942.

The installation was formally approved by the California Fish and Game Commission.





At the left is a view of the old rack-type fish screen with its attendant debris problem which was replaced by the Burkey screen shown at the right. Some 35,000 lb. of metals was salvaged from the old screen. The new one contained only 2,000 lb. and has the advantage of negligible maintenance cost

Alternate Materials, Methods

Material scarcity challenges ingenuity and imagination in design, planning and methods of distributing power

H. H. Minor

Distribution engineer, San Joaquin Power Division, Pacific Gas and Electric Co.

MANY are the changes in design, planning or method brought about by the scarcity of the usual materials in power system construction and operation. It is not the base materials alone that the engineer should be interested in conserving, but also the finished product, the man-hours of factory labor, the manufacturing time and the factory space that go into each completed piece of equipment. All of these must be saved for war materials.

Utility men have had one goal in sight for many years. That has been to provide the best possible service to customers at a reasonable cost. They have found through long experience that it is necessary to provide an ample safety factor and they have been in the habit of designing for the future—to build in excess of immediate needs. They have provided spare capacity. They have duplicated lines that serve major loads or communities. They were determined to let nothing stand in the way of practically uninterrupted service at proper voltage at all times.

Because of the war ideas have changed. As a result it may be that engineers will learn that they have been leaning over backward a little in providing that super-service; that some of the gadgets and devices thought so very necessary are not really so necessary.

First, therefore, instead of substitute materials they must substitute ideas and methods. Conventional safety factors in equipment must be forgotten and they must work every item to its utmost capacity. That does not always mean name-plate rating, or code rating, or GO-95 requirements. It means actual, honest-to-heaven maximum, commensurate with reasonable service. And reasonable service means just good enough to keep the wheels going and not burn things up.

Here are a few examples. How about transformers—substation transformers? Most subs had spares that sat on the job for years and some were never even hooked up, or in more modern subs were only switched in for test. What is the practice now? In most cases those spares have been moved out to some job where they can go to work. Of course, reasonably assured service requires some replacement equipment. How about a portable spare, located at a central point, that can be moved to one of several substations in an emergency?

Much has been printed about the overload capacity of transformers; of their life expectancy under various degrees of overload; of methods of increasing their load carrying capacity by better cooling methods. Engineers are all familiar with those things but until recently very few have profited by that knowledge. But now many have made use of it. The theories have been tested and experience has shown that transformers can take a terrible beating and stand up to it. Of course, it is sometimes necessary to give them a helping hand, a pat on the back as it were, by cooling them down a bit. Maybe only a little water run on the outside of the tank will do the trick. A spray might be better. Or fans or blowers forcing air circulation through the radiators and around the tank may be best. Forced oil circulating equipment with external cooling is now available. Name-plate ratings can be boosted as much as 50% in some instances. This is a relatively new idea—a substitute operating method—that has saved tons of critical materials and many, many man-hours of skilled labor.

Yes, losses are increased, regulation suffers, but we are still providing reasonably assured service at proper operating voltages. The added cooling equipment requires some critical material but only a very small percentage of what would have been necessary under former practices. The operating life of the transformers may be lessened slightly but that is an economic problem to be solved after all this is over. However, we are getting increased output, more kwh.—for a very small added investment. A considerably shortened operating life would seem to be justified. Maybe former ultra-conservative ideas of transformer capacities were not sound economically.

How about distribution lines? With growing loads, many of them in areas not too well equipped for service, the normal thought would be to construct a new line from the nearest substation, or to reinforce an existing line by a copper change. If distances were too great and the new load of sufficient size or would probably increase beyond the limits of good service in a reasonable time, we would probably extend a transmission line and build a new substation. What is present procedure; what is the answer viewed in the light of substitute ideas and practices because of material shortage?

First of all, we try to make existing lines carry the new load often at the expense of voltage at the load. If there are two lines serving the area involved they may be tied together or operated in parallel to take advantage of diversity between their loads. This, of course, puts the area involved in greater danger of outage, but it may save a lot of copper.

Where the loads are highly reactive—that is the power factor is low—the answer may be the judicious use of capacitors to achieve greater load carrying ability of the distribution line, the transformers and other current-carrying equipment all the way back to production. Of course capacitors use aluminum and steel but it has been authoritatively stated that to derive the same benefits that will result from the capacitor installation by increases in distribution lines will require thirty times the weight of critical materials. Is not a 96.5% saving in material that is so badly needed elsewhere worthwhile?

Or maybe we can overwork our existing lines to a considerable extent by providing regulating equipment at the load end. Maybe we can make a feeder to the load area into a sort of sub-transmission line operating at a boosted voltage and regulated at the load. Total materials required and availability of regulating equipment may decide such a question.

A case in point illustrating this last suggested solution occurred at Morro Bay. A dredging job was proposed there over a year ago and the expected load was stated to approximate 3,000 to 4,000 kva. The nearest substation was 10½ miles distant. The area was served at 12 kv. by two No. 2 feeders carrying about 1,600 kva.

It was decided that particularly due to the fluctuating character of this load and the starting dips that would occur, a separate No. 1/0 copper line would be built on existing poles to the load and a regulator (step type) be installed at the load end. This would have required 53,000 lb. of copper plus the necessary line hardware.

Plans were changed and a very much smaller dredger was installed which was adequately served from the existing lines. It proved too small to do the job and in July the company was asked to provide the originally planned service.

By that time copper was mighty scarce. Only 13,000 lb. of No. 1/0 could be found and there was no authority from WPB to use that. Service was expected in 30 days so some other scheme that would not need that No. 1/0 wire was in order.

The decision was to parallel the two feeders already built and install a

booster transformer and step regulator at Morro Bay—10½ miles from the substation. An available 5,000-kva. regulator (figured for the original plan) was used. Meantime, however, the substation serving this load had become pretty well loaded and so a 5-mile tie of No. 2 copper was built to another feeder so that some load could be switched to a different substation. Also, the town of Morro and a few customers between it and the supplying station could be served from another feeder from a different substation by a 3-mile extension. This whole project as thus planned resulted in a saving of over 25,000 lb. of copper. The resulting service was not bad and the two tie lines provided a distinct advantage from an operating standpoint.

Everyone knows how serious the shortage of copper wire is and of the necessary use of iron wire instead, where possible. But that does not answer for secondary and service wire. No. 8 weatherproof wire is not to be had.

A very interesting solution to that can be evolved. This is a substitution of material, substituting short lengths of large sized cable to service wire.

The larger cables, 500,000 circ. mil and up, are made up usually as follows:

500,000 circ. mil, 37 strands, 116.2 mils. dia. No. 9 plus.

750,000 circ. mil, 61 strands, 111.0 mils. dia. No. 9.

1,000,000 circ. mil, 61 strands, 128 mils. dia. No. 8.

1,250,000 circ. mil, 91 strands, 117 mils. dia. No. 9 plus.

1,500,000 circ. mil, 91 strands, 128.4 mils. dia. No. 8.

2,000,000 circ. mil, 127 strands, 125.5 mils. dia. No. 8 minus.

Thus the strands in most cases closely approximate No. 8 B&S gauge. Short lengths of such cable can be stripped of its lead and insulation, unstranded, the strands welded together, and the result is bare service wire. The weld can be made with a small flash electric welder and such welds have tested to at least 95½ of the tensil strength of the wire. While the weld is slightly upset, this wire can be weatherproofed by the so-called Peerless method very satisfactorily.

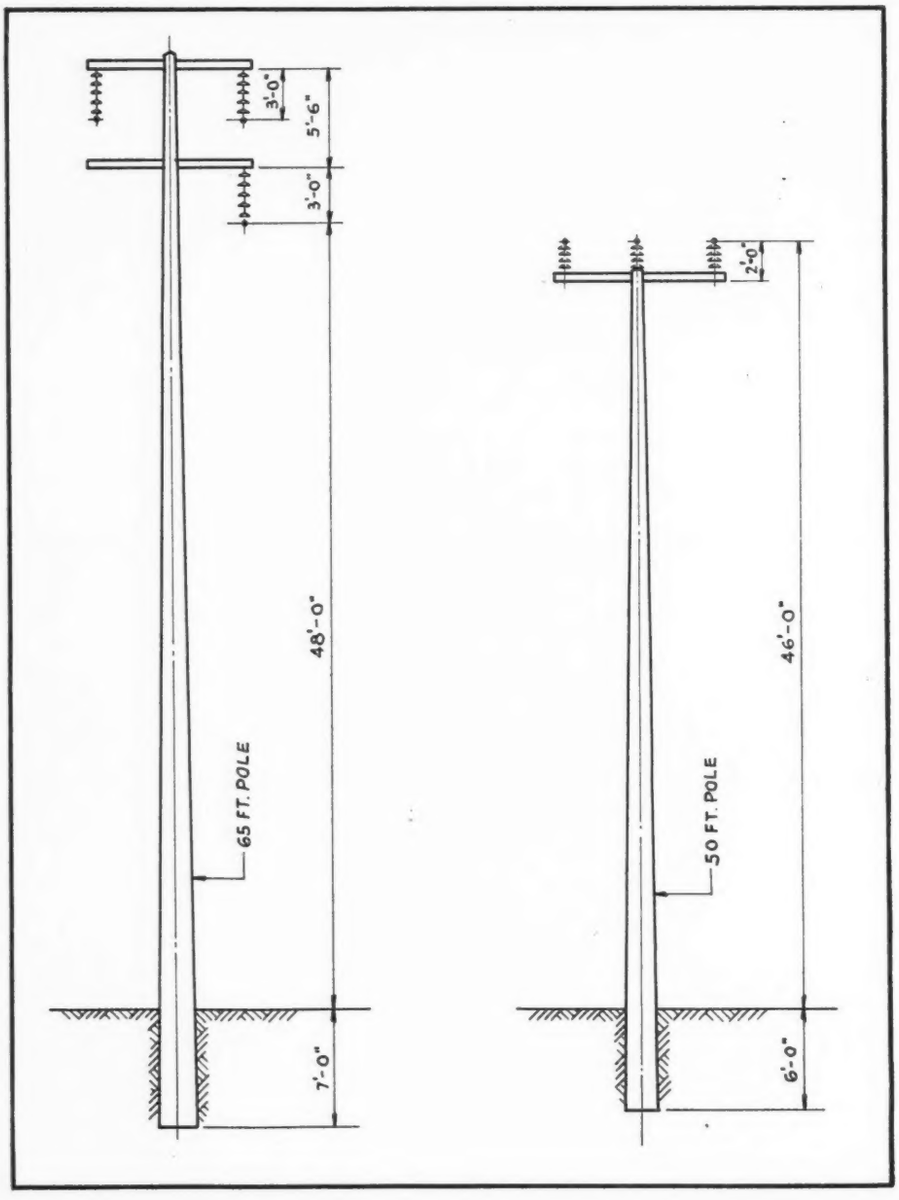
Most companies have on hand short lengths of cable, probably too short for general use. This method may produce badly needed service wire.

Another substitution that will produce needed wire is to utilize larger sizes of solid wire, No. 2 and up for instance, and have it redrawn to No. 8 or No. 6. In times past much solid wire was used and undoubtedly many odds and ends of it are left on hand, if junking procedure has not been too well accomplished. If redrawn 100 ft. of No. 2 will make 400 ft. of No. 8; 100 ft. of 1/0 will make 640 ft. of No. 8; 100 ft. of 2/0 will make 800 ft. of No. 8; 100 ft. of 4/0 will make 1,280 ft. of No. 8. This is another way that usable lengths of small wire may be obtained from the scrap pile.

An air base was recently located where a 70-kv. line crossed it for some three miles. The line had to be rerouted and the new line was 8½ miles long. Fortunately the wire, insulators, and miscellaneous hardware were available from another proposed 70-kv. line which WPB had decided was not necessary. The channel iron arms, however, that would ordinarily have been used, were not available and could not be procured in time, under the job's preference rating. Therefore wood arms were used. Exactly the same configuration was maintained as though the steel had been available and standard stock arms were used. Metal tie plates were employed which served as insulator hangers but less than 10% of the weight of critical steel was used than if steel arms had been available.

These are only a few instances of where ideas or changed plans or designs may be substituted in order to conserve critical materials. In most of the cases cited, the economic factors have been decidedly in favor of the substitute. This may not always prove to be the case but in the emergencies of war, that is something to be settled as each individual situation is reviewed to find the most satisfactory plan.

How ingenuity will save critical materials is demonstrated by this change in design for a 66-kv. line to a new war load. When Southern California Edison engineers could not get 65-ft. poles, they used 50-ft. poles with line post insulators. The triangular configuration was replaced with horizontal; one crossarm was saved; clearance was reduced from 48 to 46 ft. The shorter poles were set 6 ft. in ground



Conductor Swivel

Streamlined assembly aids in line stringing

A. A. Osipovich
Mechanical Engineer,
Bonneville Power Administration

THERE is a certain amount of inherent torque in all stranded conductors, especially in those of the expanded-diameter high-strength type which are used by the Bonneville Power Administration on its many 230-kv. lines. In most cases it is possible to eliminate the effects of this inherent torque during the stringing and sagging operations by use of simple devices, such as the Kellum flexible sock or a combination of a pair of shackles at the joint between conductor and pulling line. Simple swivel joints are sometimes used at the pulling bar attached to the caterpillar used in the operation.

To take care of the torque situations in some extreme cases the Bonneville Power Administration developed its stringing swivel illustrated in the accompanying drawing. This swivel is made up of one-half of a "Fiege" wedge-type mechanical splice joint welded to a tubular sleeve into which is assembled a suitable thrust-bearing-mounted special clevis pin.

The entire assembly is "streamlined" by making all its component parts conform as much as possible to a round shape. An efficient seal is used to guard the ball-bearing installation from dust and dirt while in operation. The maximum outside diameter of the swivel assembly and its general shape will permit its easy passage through the grooves of stringing sheaves without difficulty or causing undue impact.

The experimental swivel, made up with a thrust bearing of much lower rating than the one specified in the final design, was tested in the untanking tower of the J. D. Ross substation of the Bonneville Power Administration. During the test the large transformer lifting beam, weighing close to 15,000 lb., was raised several times clear off the floor. Yet, even under this load, which is equivalent to a pull of approximately 35% of the ultimate strength of high-strength 500,000 circ. mil. conductors, it was possible to rotate the swivel head by hand practically without effort.

Details of conductor swivel used to take care of torque in 230-kv. lines

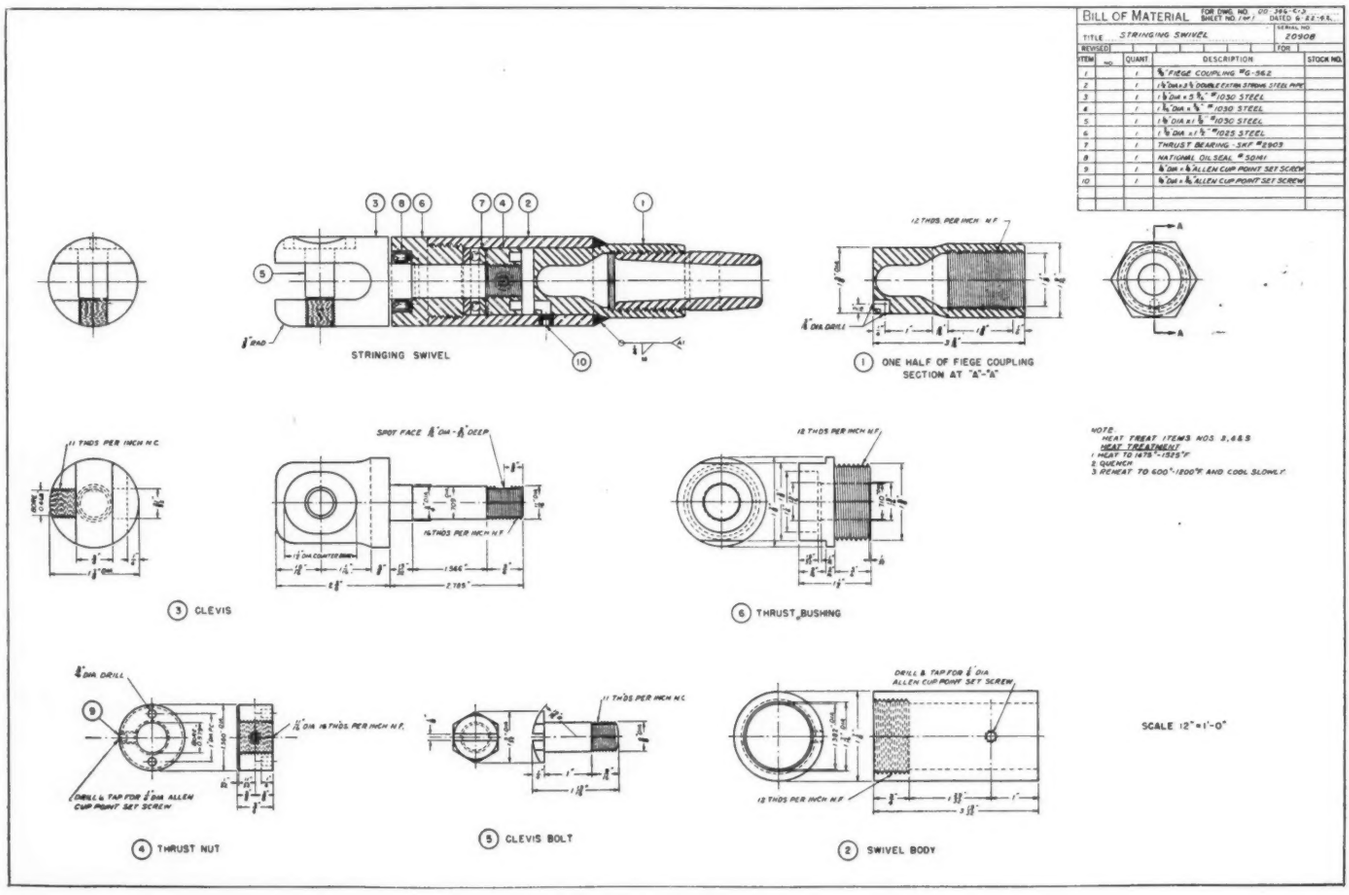
Hot Line Record Made On Reinsulation Job

Reinsulation of Olmstead-Helper 44-kv. line to 130-kv. was recently accomplished by Utah Power & Light Co. field crews without accident of any kind. Between 10,000 and 11,000 insulators were changed and because the line could only be killed on weekends, almost a third of the work was done with hot line tools.

During weekends, 5,268 new type high strength insulators were installed on the tension, semi-tension and angle structures. Crews worked 16 and 17 hours on Saturdays and Sundays so the work could be completed before heavy snows set in. Some 5,800 of the old insulators were salvaged and were later utilized on the "A" structures in the line. Extra crews were recruited from other parts of the system for the Saturday and Sunday work.

The hot line work was done with regular crews trained for this purpose. Three thousand three hundred and eighty-four insulators involving 282 structures were changed with hot line equipment.

Work on the project started August 23 and was completed October 10, a record time for such an extensive job.


BILL OF MATERIAL
TITLE STRINGING SWIVEL
SERIAL NO 20908
ITEM NO QUANT DESCRIPTION STOCK NO.
1 1 ⅝" FIEGE COUPLING "FG-562
2 1 1¼" DIA x .25 DOUBLE EXTRA STRONG STEEL PIPE
3 1 1½" DIA x 5⅝" "1030 STEEL
4 1 1¼" DIA x ⅝" "1030 STEEL
5 1 1½" DIA x 1⅝" "1030 STEEL
6 1 1½" DIA x 1⅝" "1025 STEEL
7 1 THRUST BEARING - SKF "E1803
8 1 NATIONAL OIL SEAL "50461
9 1 ½" DIA x ½" ALLEN CUP POINT SET SCREW
10 1 ½" DIA x ½" ALLEN CUP POINT SET SCREW
STRINGING SWIVEL
ONE HALF OF FIEGE COUPLING SECTION AT "A"-"A"
CLEVIS
THRUST BUSHING
NOTE
HEAT TREAT ITEMS NOS. 3, 6 & 5
HEAT TREATMENT
1 HEAT TO 1475°-1525°F
2 QUENCH
3 REHEAT TO 600°-1200°F AND COOL SLOWLY
THRUST NUT
CLEVIS BOLT
SWIVEL BODY
SCALE 12" = 1'-0"

Edgar Whitehead, foreman for A. R. Wooley, (right) manager of electrical department, Idaho Lumber & Hardware Co., Pocatello, contractor for Ogden housing projects embodying Wooley's ideas

Prefabricated Wiring for

IT has often been said that house construction had its many difficulties because too much of the construction was done more slowly and expensively at the site, instead of being prefabricated in the shop. Need for speed and standardization of war housing has presented an opportunity to see what shop assembly can do to housing. Nowhere is this better demonstrated than in the erection of some 4,000 prefabricated, demountable houses erected at three sites in and near Ogden, Utah, by Better Built Homes and Associates.

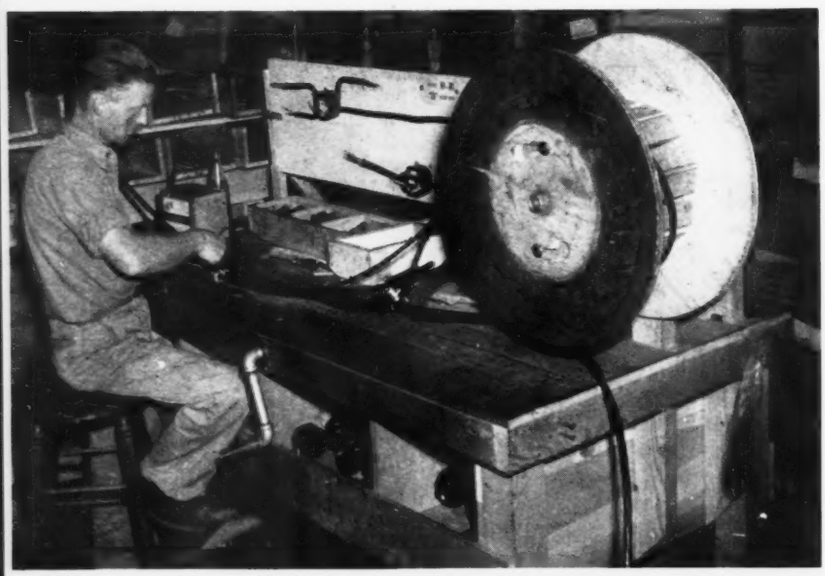
In line with the prefabrication of wall and floor panels and roofs, the electrical contractor, A. R. Wooley, manager of the electrical department of Idaho Lumber & Hardware Co. of Pocatello, developed a method to prefabricate 90% of the rough-in work in a shop. This, as in all mass production, required first analysis of the parts of the job, design of tools and jigs and shop facilities in advance, and location and assembly of materials on the job. This planning required the most time but paid in making possible extraordinary speed in installation later.

As developed by Wooley the nonmetallic cable, ten rolls at a time, was placed on a large spindle adjacent to measuring and cutting tables. Ten lengths of cable were drawn at a time, held by a special clamp and cut by an especially designed knife at one operation. Lengths of cable cut ranged from 2½ ft. to 14½ ft. Cut cable lengths were then passed to the next man, who stripped the wires for connections and placed the cut wires into trays.

These trays then went, with wires of a given length in each, to the assembly bench. Here with a sample showing connections on a template board in front of him, the electrician brought together cable lengths required and wired them to the ceiling outlet boxes. As each circuit was finished it was rolled on a cable reel at the end of the bench. A handy crank close by made this convenient. When finished, the end of the reel was removed and the circuit tied and slipped off ready to go.

Each circuit was tagged. With two circuits per house two makeup tables were required and were designated A

Ten lengths of cable clamped and cut at one stroke on measured tables, the ends stripped ready for assembly (below) to boxes, rolled up and ready to send to the job prefabricated. Note removable end on cable reel at assembly bench



Switchboxes, multibreaker, ground clamps and other fittings placed in sacks for each room or unit before delivery to the job

Prefabricated Houses

and B. One A and one B circuit were sufficient to wire one house or unit. Because the units were arranged both right and left, circuits were further classified as AR and BR.

All that remained for the rough-in now was the can for the service center, the switch boxes and ground clamps. These were preassembled in a paper bag, one for each unit, and distributed along with the circuits to each housing unit. The ears were broken off the boxes to make a snug fit in the plywood wall previously cut for the box. Switch and receptacle fittings had likewise been counted out and delivered, in special trays made to hold the devices for 12 units or houses, a good day's work for one journeyman. Another journeyman preceded with a tray carrying service entrance equipment consisting of an MO type circuit breaker, cover, lead-in cable, sill plate, etc.

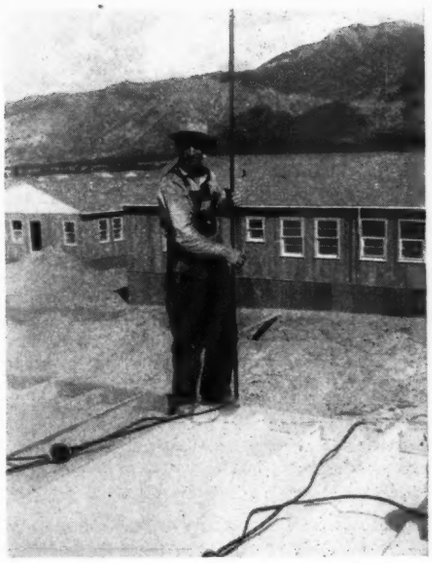
At the site as fast as the floor, wall and ceiling sections were placed a journeyman unrolled one of the circuit assemblies. He worked from over the ceiling. Here he placed the outlet boxes and rammed the switch legs or convenience outlet leads down through the partitions with a ramrod made from a piece of ¾-in. electric metallic tubing cut in half lengthwise. This half-round shell was tapered to a blunt point into which a saw cut was made in which to hook the bare wire ends to draw the cable with it into position.

Another journeyman below pulled the wire through the precut openings, affixed the switch box to the opening, using Appleton "E-Z-In" switch box supports to draw the box tight against the wall. Wooley says the installation was done in a matter of 15 or 20 minutes. "We can get on and off the ceiling between the ceiling crew and the roofers. This completely eliminates any interference with the builders and means that we can wire a house without holding up construction," he declared.

The service job proceeded about twice as fast as the other, so one service journeyman could keep the two device men busy. Following the device man came the fixture man. Fixtures had been previously unpacked, checked for completeness and fit of all parts and delivered to the job in their proper rooms by helpers.

With a crew of eight journeymen and three helpers and a foreman Wooley was finishing at the rate of 20 units per day, which was as fast as the painter was getting ready for him.

Another point in favor of the method was that it saved materials. Every bit of the cable was used. Small ends made pigtails. Knock-outs and the ears off the boxes removed at the shop went into the scrap salvage; were not lost in the dirt of the job. Unpacking in the shop kept the job clean.

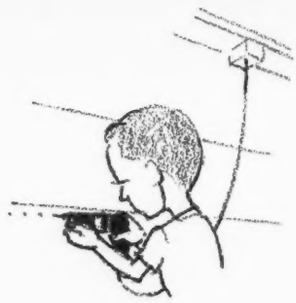


Prefabricated circuit is pushed down between wall sections to outlet box locations using ramrod made of ¾-in. steeltube which is split in half lengthwise

Prewired ceiling outlet box set in place above the plywood ceiling and connections made to feeders

Cable end is brought out at precut hole for switch or outlet box, which is inserted and held in place by special switch box support. One man (below) sets the boxes, another makes connections to the switch or outlet fitting. Another man connects the outdoor porch light. Another crew connects the services and multibreakers

Busway Plant Distribution—II



Flexibility to changes in plant arrangement and to welding sets with plug-in switches and fittings

*Lester Siebert**
Manager,
Trumbull Electric Mfg. Co., San Francisco

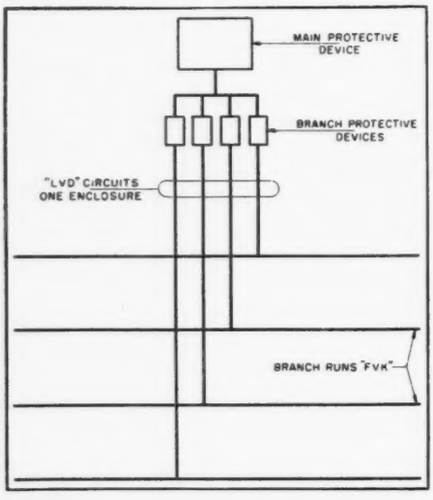
Feeder busways were described in the first article, their construction, design to reduce reactance losses to a minimum, their carrying capacities both for the enclosed and the air cooled types and the calculation of voltage drop. The present article continues with applications of the busway to industrial applications, particularly welding sets, and describes plug-in busways and the enclosed trolley for craneways

FAVORABLE characteristics of the low voltage drop busway design are primarily assignable to the standardization on narrow busbar sizes and to the very close face-to-face arrangement of the bars, which permits the interlacing of insulated busbars on multiple bar assemblies.

This configuration and close spacing of busbars result in proximity effects which nearly neutralize the skin effects in the respective bars, producing an almost uniform distribution in each bar. Non-uniform current distribution within the busbars is the cause of high a-c d-c resistance ratio values.

The interlacing of phase bars on multiple bar designs, the beneficial effect of parallel conductors, the high mutual inductance of the closely spaced bars and the uniform current distribution within the busbars, produces a reactance which is even lower than the a-c resistance. It is substantially lower than that obtainable in ordinary enclosed busbar designs or conduit and wire feeder installations.

"Tree System" with branch circuit protection at the main switchboard



Based on actual laboratory electrical tests these designs have been developed to withstand mechanical stresses which may result from short circuit currents in the magnitude of 100,000 R.M.S. amp.

A carbonot sheathe encloses each individual conductor in the ventilated design. It is mechanically strong, impervious to moisture, fire-proof and has a high factor of heat transmission. This quality, combined with rugged construction, makes it safe and practical to provide vents in the enclosures to obtain the advantages of free airflow upon the insulated busbars, which permits busbar ratings closely approximating the ratings of the same busbars in air.

Welder Busbar Distribution

The war program has tremendously stimulated the use of electric welding, particularly in industries engaged in the building of ships and tanks. Too frequently, the welding equipment, in itself, is blamed for "poor welds," whereas the answer may be in the electrical supply to the welding apparatus.

It is necessary to obtain close voltage regulation because of high instantaneous current values for very short-duty cycles. More care is required in the planning of a welder distribution system, therefore, than for normal loads of the known and more continuous types. This has brought about designs of busbar systems for this specific purpose.

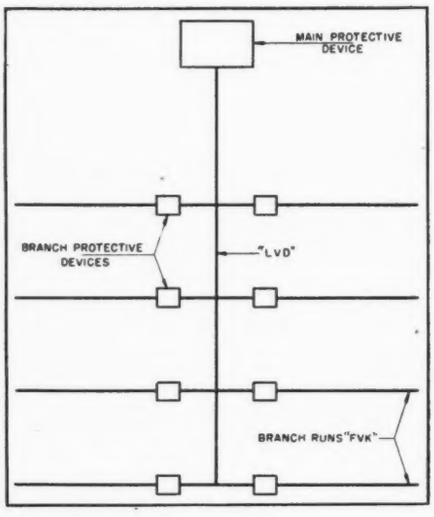
The more common types of resistance welders to be considered as loads, are flash, butt, projection, spot, portable and seam. The common characteristic of welding machines is that they are provided with a transformer for reducing primary voltage through a secondary winding to electrode voltages—usually 20 volts or less. This transformation produces high current values at the secondary electrodes. The magnitude of these secondary currents is affected by the type of weld, shape of material being welded, duty cycle and the like.

In the designing of a busbar distribution system for welding service, two sets of characteristics must be considered—electrical and mechanical—and each must be adapted and adjusted to the other if satisfactory results are to be obtained. Among these the principles are as follows:

A. *Electrical Characteristics* — Field experience indicates the use of rectangular busbars ¼-in. thick that are interlaced and arranged with opposite phase relation at 11/16-in. spacings. Polarity clearance between these closely spaced conductors may be obtained through the use of high dielectric strength barriers. The close spacing and interlacing of conductors results in an extremely low impedance drop. The busbar conductors should be rigidly supported on non-carbonizing insulators, spaced on 24-in. centers, to provide the required strength to resist surge voltages inherent to welder loads and possible short circuit current stresses.

B. *Mechanical Characteristics* — The system should be designed to meet practical installation requirements of the modern industrial plant. All units of equipment should be standardized to provide the making of original installations economical and to make possible future rearrangements without loss of equipment. Convenient provisions are desirable for connecting welders to the original installation or rearranging existing welder loads to new locations on the system.

"Radial System" with branch protection located near the load in each instance



* Presented at the annual meeting of the Southwestern Section, International Assn. of Electrical Inspectors, Fresno, Sept. 22, 1942.

Plug-In Busways

The needs of industry, particularly those engaged in the war effort, for a greater convenience of power is being met by manufacturers with a system of power and light plug-in devices which engage busbars supported within a metal enclosure.

The complete system for an industrial plant usually consists of a number of overhead parallel busway runs located according to machinery concentrations, plant conditions and column centers. These bus structures are usually located overhead and supported by building structural members.

Connections are made to the busway circuits by the insertion of combination plug-in switch and protective devices at such points as to provide the most economical branch circuit layout.

Branch circuits are extended from the plug-in protective device by the customary wiring method to the individual power equipment drives or distribution centers.

The growing need for the installation of static condensers to correct for low power factor has led to the design of plug-in capacitors which correct for power factor and improve the voltage regulation on the busway. The location of these capacitors, of course, depends upon the characteristics and distribution of the load but as a rule a location near the load end of the busway provides best results.

Enclosed Trolley

Another very important member of our enclosed busbar distribution family, which is extensively used in many war production plants is called Trolley Closur.

This enclosure for trolley is a system developed to provide industry with a better, safer, standardized system for supplying power to portable electrically-driven tools, hoists, cranes, drills, screw drivers and cutting machines. The system consists of copper conductors, enclosed in a suitable steel housing. The current in the busbars is collected by trolleys which serve and directly connect to portable or movable electrical devices.

Although the "standardized" trolley enclosure consists of channel-shaped copper conductors having a rating of 100 amp. several thousand feet of heavy-duty Trolley Closur have been manufactured in our San Francisco plant and installed in West Coast shipyards and industrial plants.

These heavy-duty installations are manufactured with copper conductors up to a maximum of 500 amp., 440 volt, 3-phase, and provided with individual trolley collectors of 225-amp. capacity. It is available for either indoor or outdoor service.

It is obvious that this paper can only touch on the high spots of the "Application of Busways in War Production Plants" but all reports from various industrials and governmental branches attest to the successful and economical performance of this system of electrical distribution.

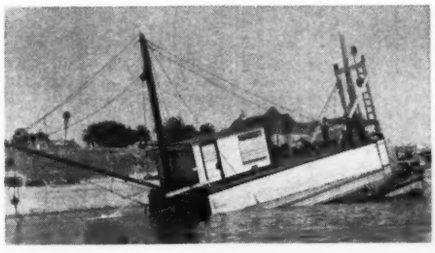
Submerged Salvaged

Salt encrusted dredge motors dried out by infrared lamps

SUBMERGED for 80 days in ocean water 12 ft. deep, the windings of a 350-hp., 2,300-volt synchronous motor were successfully dried out in a few days by using infrared heat lamps at Quality Electric Co., Los Angeles. Time saving by this method, as well as satisfactory electrical results, indicate that this method can be applied to many similar types of jobs with profit.

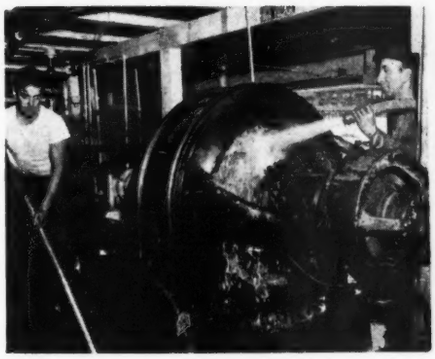
The motor weighed about 7,000 lb., was wound for 2,300 volts and powered the large dredge pump of the *Anita* from Sept. 1, 1938 to June 15, 1941 at Santa Monica, Calif. The smaller motors were all 440-volt, the 50-cycle current being supplied by the Southern California Edison Co. The *Anita* is powered for 16-in. sand pump, 24-ft. ladder, cutter and heavy duty hoists. The motors are 350, 40, 30 and 10 hp. each while the four transformers are 25 and 15 kva.

After lying idle since June 15, 1941, on completion of city dredging, on Feb. 9, 1942 the *Anita* sank in 12 ft. of salt ocean water in the Santa Monica dredge pond on the ocean front, with motors, transformers, switchboard, control equipment, and all other machinery and equipment completely submerged



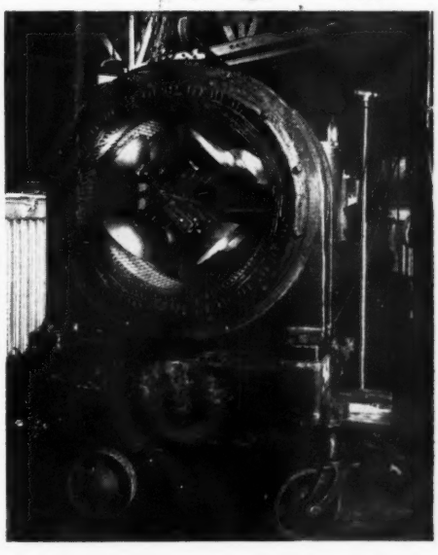
for 80 days until April 30, 1942. It was pumped out and refloated by its new owners, F. M. Strobridge and F. L. Smith, in exactly 35 min. after divers had located and plugged hull leaks.

The electric motors were hosed off with fresh water as they emerged from the ocean brine. The hosing off operation was continued without interruption for about three days. Meantime, the transformers were drained and also thoroughly washed. When no salty reaction was further evidenced the whole electrical equipment, including the 2,300-volt submarine cable which also had been submerged, was hauled to the plant of the Quality Electric Co. in Los Angeles and turned over to J. O. Case, president of the company, who had advised with the new dredge owners from the beginning.



Three days washing with 2-in. stream of freshwater to remove salt incrusted windings dried out by infrared lamps

After being steam cleaned all electric equipment fully responded to drying and baking treatment except two small motors and a small transformer. Examination clearly indicated that these were ready for rewind before submergence and consequently could not be reconditioned otherwise. Wherever possible infrared lamps were used for drying and baking. Batteries of these lamps were arranged and located so as to afford the greatest efficiency. Conventional drying oven baking methods were used on some of the parts, such as transformer coils and submarine cable. The drying time for the large 350-hp. motor with infrared was 72 hours. Sixteen 250-watt infrared lamps in 10¼-in. Fostoria gold plated reflectors were used. The energy used was 4 kw. for 72 hours or a total of 288 kwh. After thoroughly dry and megger-ing infinity the motor was given standard AIEE high potential test.



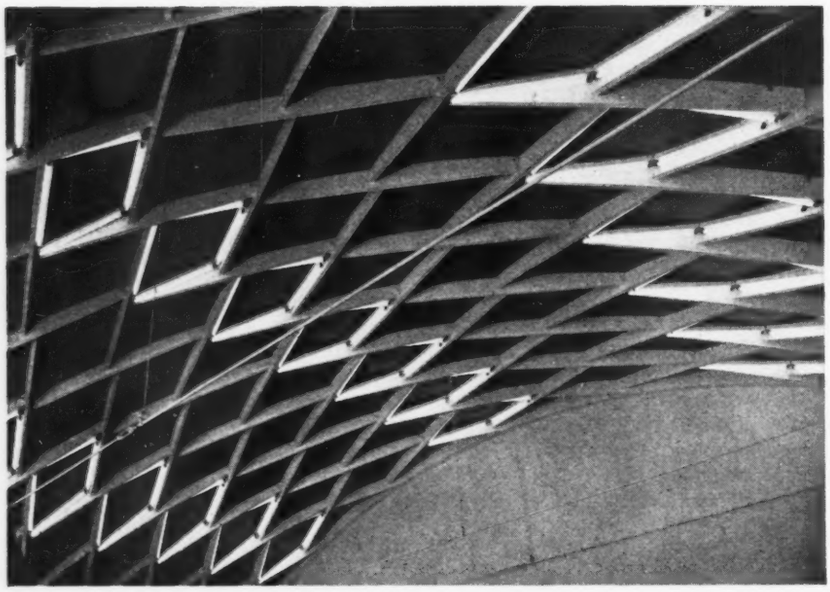
Who

Coast Counties Gas & Electric Co. branch offices at Rodeo (upper right is the exterior, below the ceiling interior. See also p. 53 Sept. 1942 issue) and at Antioch, Calif. (lower left). Lynn D. Duckering, architect, designed the lighting as part of the structure. Installation at Rodeo by Fred Schmits, Oakland; at Antioch by C. A. McLaughlin, Antioch.

The Need

Interior illumination, itself inconspicuous as to source, to give even, diffused lighting both for floor display of appliances and to provide easy seeing for office personnel and customers at the service counter and back of it. Exterior need to attract attention of passersby to the location of the office.

LIGHT for UTILITY OFFICES



Conditions

At Rodeo—building with 37-ft. span, arched lamella roof, open beam construction, 32 ft. long; walls 11 ft. high, height to center of arch from floor 20 ft. Ceiling painted Wedgewood blue field, ribs Wedgewood white; walls warm cream; floor rose colored asphalt tile. Entrance has panel of glass brick down full length of side wall from the flat ceiling.

Installed

For interior lighting—128 No. 2 x 446 C Curtistrip fluorescent units, using 30-watt 3500°K. white lamps placed in 32 of the lamella roof ceiling sections, 4 to a section forming a diamond pattern in three rows lengthwise of the office.
Exterior—Four 200-watt silver bowl lamps in Curtis reflectors mounted symmetrically in a row flush with the entranceway ceiling. Later tubular fluorescent lighting will be installed behind the glass brick, using color.

Results

An average of 35 foot-candles on desk working surfaces.

Conditions

Antioch office—Flat ceiling with slight rise only, room 32 x 24 ft., 11-ft. ceiling. Painted warm cream color between troffers, walls the same; floor tan colored asphalt tile.

Installed

On 6-ft. 8-in. centers, 5 20-ft. Curtis 1630 troffer units, and one 12-ft. troffer, using 40-watt 3500° K. white lamps. White Zeon sign on exterior.

Results

Evenly distributed illumination of 35 fc. average at desk working surface level.

EMEA *Dope Sheet* — *Edited by Howard C. Park*
EMEA of So. Calif

Voltmeters, Ammeters and Wattmeters

Instruments make use of three electrical effects according to the type of measurement to be made and required accuracy

THE three effects of an electric current—the magnetic effect, the heating effect, and the electrochemical effect—are all used in electrical measuring instruments. Of these there are several general types, mainly, permanent magnet, iron vane, electrodynamometer, hot wire, and induction, and of these some are suitable for direct current only, some for either direct or alternating current and others for alternating current only.

Electrical measuring instruments are divided into three classifications based on the type of work to which they are put:

(A) Laboratory standard
This type of instrument, constructed with the finest materials and workmanship obtainable, is used by The Bureau of Standards, and other standards laboratories, in the establishment of international electrical values.

(B) Commercial laboratory
These instruments while still high in quality and accuracy are of more sturdy construction, to withstand continuous use and handling. They are calibrated from the laboratory standards, and are used by commercial laboratories to calibrate commercial instruments, resistances etc.

(C) Commercial measurements
Most of the instruments fall into this class. They are constructed to withstand rough handling and normal overloads and vary in accuracy depending on quality and type from plus or minus ½ to 5% full scale value.

Of the general types, the permanent magnet, moving-coil instrument known as the d'Arsonval type, is the most common direct-current instrument and has the highest sensitivity of all of the magnetic instruments. The principle of the d'Arsonval movement is that of a coil of wire carrying an electric current suspended in the field of a permanent magnet. The coils on the small and the low value meters are wound with enameled wire and are made self-supporting as this gives maximum conductor cross-section for a given winding space. In the larger and the higher current instruments the coil is usually wound on an aluminum spool which is in effect a low resistance short-circuited turn and gives electromagnetic damping to the instrument. The pointer is fastened rigidly to the coil and is returned to zero by a pair of spiral springs which also act as conductors for the moving coil.

The permanent magnets used in the d'Arsonval instruments are divided into two major classes. The first comprises the chromium and tungsten alloy steels, used in instruments with magnets of a long magnetic path in the material, compared with the short air-gap where the moving coil is located.

The second class of magnetic materials includes cobalt-steel, alnico, and other substances that have high coercive force. Since these materials are highly resistant to demagnetizing forces, they are used in instruments whose design calls for a magnet of large cross-section and short length of magnetic material.

For measuring amperes of a value greater than can be handled by the copper in the moving-coil and the hairsprings which carry the current from the stationary parts to the moving coil, a shunt is placed across the terminals of a millivolt meter. These shunts having a definite resistance will have, according to ohms law, a definite voltage drop which is in direct proportion to the current that passes through the resistance, the drop in this case being of the order of millivolts. The instrument is calibrated to read in amperes and must be used with a shunt whose voltage drop is within the range of the instrument.

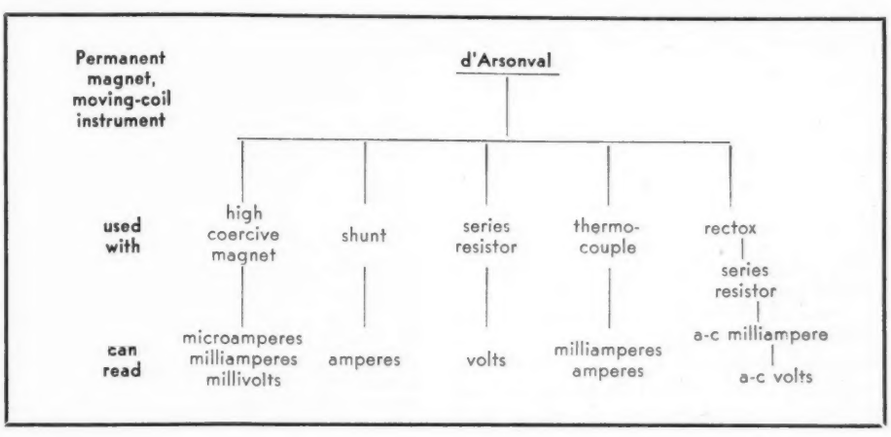
The second general type, the iron vane, is simple in construction, has a minimum of parts and is characterized by a high overload capacity. The moving system of the repulsion iron instrument, with its single spiral spring and moving iron vane, makes it one of the simplest of the magnetic instruments and has wide use in the field of commercial and audio frequencies.

The repulsion iron instrument has the lowest value of sensitivity of the magnetic instruments, .15 watts being required for a 3-in. panel-type ammeter, where a d'Arsonval type on direct current would use current of the order of micro-watts.

To secure the necessary magnetic field with very low currents, the voltmeter coils have an appreciable inductance and while good over a wide range of commercial frequencies this type is not recommended for audio frequencies. The ammeter has constant accuracy to about 750 cycles per sec. with a drop in accuracy to 80% at 10,000 cycles per sec., making the ammeter suitable for use on audio frequencies.

Since the repulsion iron instrument has an actuating coil of low flux density, external fields change the readings, and this fact must be taken into consideration. Most portable and switchboard instruments employ a magnetic shield for this purpose. Unshielded types must be mounted six inches or more away from conductors carrying up to 50 amp. and spaced at least six inches apart.

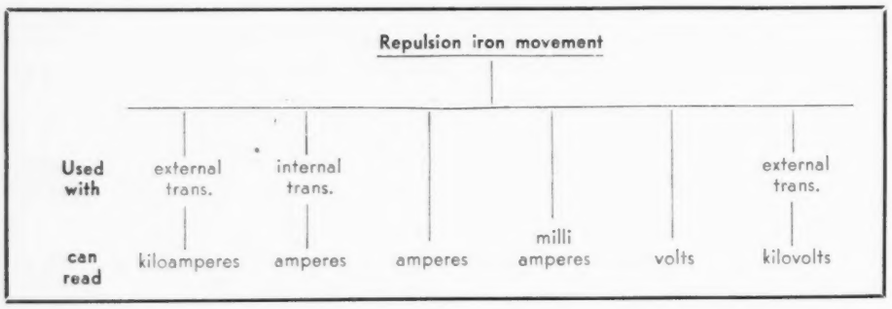
An important difference between the a-c and d-c instruments is, that with suitable potential and current transformers any value of a-c voltage or current may be measured with a low value instrument. While direct current instruments are connected directly to the lines being measured, the alternating current instruments are completely insulated from the lines when transformers are



used. As an example, the secondary of a potential transformer may be connected to a 150-volt meter so that it reads full scale when 150,000 volts are applied to the primary, or a 5 amp. meter will read full scale when 200 amp. is passed through the primary of a current transformer having a ratio of 200 : 5.

closed-circuit secondary, usually a copper or aluminum disk. In indicating instruments the rotation of the disk is opposed by springs of such strength that the full current for which the instrument is designed will give full scale deflection.

Induction instruments are made in



The electrodynamometer type has no iron or permanent magnets in the magnetic circuit but depends for its action upon the force exerted by one current carrying circuit upon another current carrying circuit. When a current flows through one or more fixed coils, they set up a magnetic field directly proportional to the strength of the current passing through them. Within this field is arranged a moving coil or system of coils, through which current may be passed. If the two sets of coils are connected in series the turning force for a given position of the coil system is proportional to the square of the current and is independent of its direction, and is equally correct for direct currents and for alternating currents of any commercial frequency or wave form. This type instrument is used in voltmeters, ammeters, wattmeters, and with suitable accessories such as potential and current transformers, shunts etc., will read in kilovolts, amperes, kilowatts and megawatts.

The hot-wire type of instruments utilize the principle that when a current of electricity passes through a wire, it produces a heating effect which is proportional to the square of the current and to the resistance of the wire, or:

Heating effect=I^2R.

The expansion of the wire when heated by an electric current is used to indicate the amount of current passing. Hot-wire instruments are equally accurate for a-c or d-c and are used as voltmeters and ammeters. Due to the principle of the hot-wire instrument, it is of necessity a low value instrument, but is very valuable for measuring currents of high frequency, such as that used in X-ray and radio work.

The induction type instrument is suitable for alternating current only and depends upon the principle of a rotating magnetic field, which is energized by the current to be measured, acting on a voltmeters and ammeters and the induction principle is used in the construction of alternating-current integrating watt-hour meters for measuring a supply of electrical energy.

Compressing Scrap

Scrap metal used in war production must be compressed into a tight bundle, since loose pieces dumped into a furnace would not melt but burn. A 165-hp. hydraulic baling press is used in reclaiming scrap metal at the A-1 Iron and Metal Co., Huntington Park, Calif. Old auto bodies, wire, steel stampings and other metal salvage are grist for the press, one of the largest of its kind on the coast.

After the metal is placed in a triangular shaped pit, a wall closes in, forcing the metal into a rectangular shape. A ram moves into this mass, squeezing it into another shape. Another ram moves up from the floor, finishing off the scrap into a 500-lb. bale, ready for the fires that will consume the Axis.

A 100-hp. motor drives the main hydraulic pump that operates the piston. A 40-hp. motor drives another hydraulic pump that actuates the hydraulic door. A 25-hp. motor operates the air compressor.

All metal in the process is handled with an electro-magnetic crane.

Automobile body being compressed into a bale by an ingenious electric press.

What to Watch

REPLACEMENT of electrical equipment will not become easier—it will be more difficult as the war goes on. Plants shut down in time of war are equivalent to giving assistance to the enemy. With such a realistic thought, the Chicago division of electrical inspection gives a number of maintenance hints that are well worth repeating for Western maintenance men and electricians.

"Do not invite calamity by allowing any one in any way to tamper with or change electrical wiring, fuses or other equipment unless they are fully competent to do so. It should be kept in mind that at the present time it may be impossible to replace equipment and even when possible, long delays unquestionably will be experienced. This means loss of labor hours and production so necessary to win the war.

"Some of the items that should get particular attention are:

Condition of conduit where exposed to weather or rust.

Condition of wire, as to abuse, overload or mechanical injury.

Condition of switches, service, submains or motor switches.

Cabinets, wiring and equipment therein.

Fuse holders and fuses, especially as to over rating, tampering or shunting.

When surveying an installation, checks should be made for loose contacts which may be caused by poor splices, unsoldered joints, loose terminal screws, poor contacts at fuse clips or switch blades. Also there is the defective snap switch, missing guard from portable extension light, defective ground on portable equipment, and no ground on equipment connected temporarily. A periodical check-up of these and similar small items will forestall possible trouble and shut-downs in the future.

Systems should be checked for grounds where the current may be diverted or lost, or overloads created.

Sub-standard wiring such as cord wiring, open wiring or "temporary wiring" where fire or shock hazards could exist.

Terminals on equipment where current is creating heat, deteriorating equipment, with the consequent loss of power.

Brass shell sockets which may create "shock" hazards when so located.

Do not allow extensions or changes to existing wiring unless assured of electrical capacity on existing wiring for such extension.

Do not use materials unless such materials have the Underwriters' Laboratories or other recognized laboratories approval.

Do not allow any changes or installations unless they are made in accordance with recognized code standards. This can best be determined by inspection by proper authorities.

Dimout Prosecutions

Violators pay fines; test blackouts in Mountain area

That violators of the dimout proclamation should begin to feel its teeth and know the period of warning was past, the Office of Civilian Defense, 9th Region, issued stern demands upon the police departments of the region to start prosecutions. The month past was marked, therefore, by police and warden activity throughout the region to obtain full compliance with General De Witt's orders. Other developments of the past month were practice blackouts in the Rocky Mountain and Middle West areas, and the order to Vancouver, B. C., to dimout too to reduce skyglow.

In Pacific Coastal regions, covered by Proclamation 12, arrests were made. First to feel the determination of police to meet OCD's demands were store owners who had put off doing anything about the shading of store lights, windows, glass transparencies, outdoor signs. Typical was San Francisco where in one two-week period 29 violators were brought to court and $875 in fines assessed. Berkeley police had rounded up 119 violations for the judge in a similar period and were making a city-wide survey of residential districts using the auxiliary police to aid the regular force.

Seattle was made defendant in a suit brought by Mrs. Effie Green for damages she claimed were occasioned because the city had turned out street lights that had not yet been brought into conformity with regulations. In the dark she had fallen and injured herself.

Vancouver, B. C., decided to reduce its skyglow too. Located off the Straits of Georgia, protected from the Pacific by Vancouver Island, the "visible from the sea" restrictions of the coast are not to be invoked. In Victoria, on Vancouver Island the dimout is complete. But in Vancouver the ARP advisory committee is working to reduce skyglow. Some 11,700 street lights will be hooded.

Trial Blackout

Two test blackouts were ordered in December in regions east of the states covered under Proclamation 12. On Dec. 7 a trial blackout was held in Idaho, Utah and Montana. On Dec. 14 nine states east of the Rockies were given a test blackout, among them Colorado and Wyoming. In both instances the test was only relatively successful. As in coastal regions at first it was found there were insufficient sirens to be heard by all parts of cities and the population had not been sufficiently informed. The tests were in a measure a means of checking the efficiency of the local civilian defense organizations as well as of blackout response.

Because of a shortage of Christmas trees as well as because of compliance with the order the absence of lighted Christmas trees was noticeable in December in the Far West. No outdoor lighting was permitted in the dimout region and even lighted trees indoors were asked to be hidden behind window shades to reduce skyglow.

The headlight dimming problem was still giving OCD officials worry although progress was made in installation of resistances in headlight circuits to reduce beam candlepower, but strict enforcement of this phase of the problem was still lagging.

School Daylight

Printed in *The American School and University*, an annual publication of highest integrity circulated to school executives only, an article by Leland H. Brown, assistant professor of electrical engineering, Stanford University, entitled *Planning Schools With a View to High-Level Daylight Illumination in Every Classroom* successfully ran the gamut of investigation and scrutiny necessary for its inclusion in that publication. It was printed in the 1942 edition.

The study on the use of daylight illumination has been carried on by the Sight Conservation Council, research committee, for northern California. The article was by invitation because of the growing importance of the subject in schoolhouse planning.

The very many factors involved in designing school buildings to take advantage of natural daylight are well explored. They do not actually lead to the conclusion but it may easily be drawn that a good artificial lighting system is a solution sometimes more easily attained than the structural changes necessary to take full advantage of daylight.

As to artificial illumination, Dr. Brown recommends a system primarily to supplement natural light and to supply about 20 foot-candles in addition to daylight. Eight 500-watt luminaires using silver bowl lamps, he said, would probably be the present choice and it should be indirect illumination. Present prices of fluorescent fixtures preclude their use economically, he wrote, and moderate priced equipment does not protect the eye from the 2,000 foot-lambert brightness of the bare lamps themselves.

The article is considered of great value in the publication in which it appears.

Unfreeze with Steam

Steam to "unfreeze" electric wires in old conduit runs so that they may be withdrawn for rewiring the building has been applied successfully in a building in Chicago, according to the December issue of *Chicago Electrical News*. The steam generator, fired by bottled gas, was developed by the Utilities Research Commission, of Chicago, in the laboratories of Commonwealth Edison Co. Live steam under pressure of about 60 lb. is shot into old conduit runs, heats up the interior, emulsifies the hardened wax and asphaltum on the outside of wires producing a lubrication the length of the pipe and the wires can be pulled easily. Once the first wire is removed the others, it is said, come easily. Savings in copper and especially of steel in conduit for rewiring, plus the use of existing conduit runs for new wiring with thin-wall insulation, offer many possibilities for the method in postponed postwar rewiring of buildings.

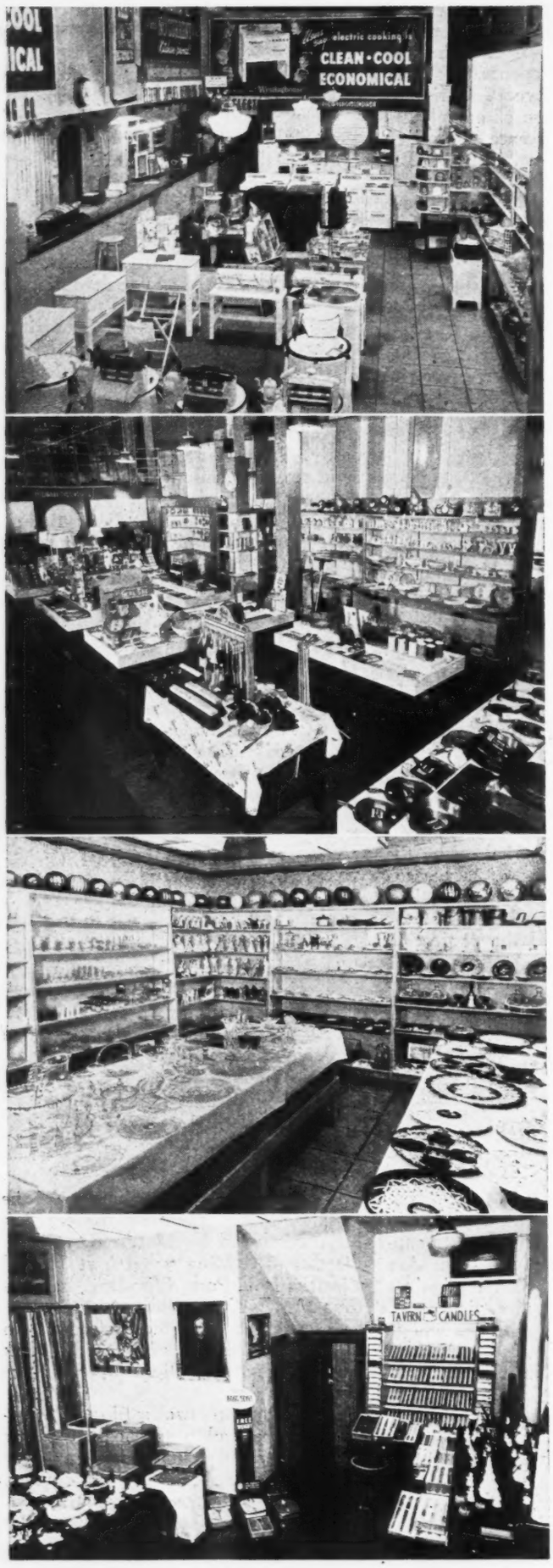
More Anti-trust

Manufacturers of fluorescent lamps and even of fluorescent lighting equipment were charged by the Department of Justice with violation of the anti-trust law, Dec. 9. The government charged that these manufacturers had entered agreements tending to monopolize the manufacture of fluorescent lamps. In addition to General Electric, Westinghouse, Claude Neon and others, even Electric Testing Laboratories, Corning Glass Works, Reflector Lamp Manufacturers' Institute and Fleur-O-Lier Manufacturers Assn. were named in the indictment. This case follows a similar one charging several manufacturers with monopoly and restraint of trade in the incandescent lamp manufacturing industry.

Visibility Rule

A slide rule device to measure visibility, used in connection with the Luckiesh-Moss Visibility Meter, has been developed by Matthew Luckiesh, director of lighting research at General Electric, Nela Park, Cleveland, and Arthur A. Eastman, laboratory expert. The device permits quick determination of relative visibility of any visual task when amounts of light upon it are changed.

It consists of two calibrated cardboard disks and a transparent sector element about 6½ in. in diameter. Use is made of nine sizes of printing type face by which to translate relative visibility values into terms understood by the layman.



Housewares Evolution

San Diego Wholesaler switches appliance department to general housewares and takes dealers along

WHEN the War struck in December 1941, the Electric Supplies Distributing Co. of San Diego was in the same position as other long established wholesalers of electrical appliances and allied equipment. It was just rounding out shipments of refrigerators, radios, ranges, washers, ironers and other major and small appliances to its dealers which added up to all-time sales records. Plans for 1942 were well under way and while the new year prospects obviously were not in line with the record breaking volume then being enjoyed, there was no indication that appliance manufacturing would face complete curtailment.

But within two weeks after Dec. 7, the management of this distributorship thought it could clearly see what would happen to its major appliance volume in the months to come. Consultations were held and as a result, president Sam L. Hall dispatched himself on a hurried trip in late December to the Housewares Show in Chicago. There, ideas developed and decisions were made which have transformed this once exclusive appliance and supply distributorship.

To begin with, the organization decided it could remain in business for the duration and serve a real need at the same time by continuing to supply appliances as long as they lasted, and by starting at once to develop for distribution kindred lines into which its extensive list of dealer customers could easily work. So it was, that while stocks of appliances, mostly with their days numbered, still continued to roll in from factory sources, the new departments were established.

In January, the first orders for ironing boards, clothes dryers, synthetic food containers, kitchen utensils, defense ladders, clothes hampers and other items in some way related to the business of most dealers, commenced to come in. But it wasn't an easy matter to gain the attention of the average dealer who still had plenty of appliances on hand with fair chances of getting even more. It was a slow, tough job in the beginning to sell the idea that other lines should be taken on *before* appliance stocks were exhausted, not afterward.

Appliance and supply sales force who had been calling on dealers for years took to the assignment with enthusiasm. Not a man was pulled off the job. At first, while appliance stocks were still trickling in from factory sources it was a combination assignment, but gradually the salesmen swung more and more into the new regime. In April, the first housewares showing of the organization was held. During this open house period of several days, most of the Electric Supplies Distributing Co. dealers came in to see just what really was going on. Prospects who had been warmed up by the field force had their eyes opened to the possibilities and a number who had not previously stocked this type of merchandise did so enthusiastically.

Gradually, following the first showing, new and broader lines were added. By the time the fall showing was held in September, attracting several hundred people, there were types of merchandise almost too numerous to count, suitable for sale by the appliance dealers of the territory. The

Appliance display space as it used to look, at top, and as it appears now with pots and pans and glassware. The clock and small appliance and radio rooms, shown next were converted to glassware and to candles, scales, etc.

list now covers every conceivable type of kitchen equipment such as cooking utensils, cutlery, dishware, refrigerator accessories and miscellaneous gadgets. There are laundry baskets, ironing board covers, bathroom rugs, cabinets and clothes containers of various kinds. Hardware items include such things as garden tools, pails, paints and numerous similar equipment. Paraffin products include waxes, polish, sprays, insecticides, table candles and decorative table pieces. Gift wares cover a wide field and there are many kinds of games and toys—not to overlook carpet sweepers and bathroom scales.

Not only has this organization been able to maintain and expand its business, but it has had the satisfaction of knowing that many of its dealers will be able to weather the storm because of new lines they have been encouraged to adopt. Contacts of long standing between distributor and dealer have been kept alive and will continue active because of this firm's determination to keep going and to help others do likewise.

But although non-electrical merchandise now comprises the great bulk of this distributor's business today, those things of electrical nature which could be continued have been actively promoted. Lamp sales, for example, have been most aggressively pushed this year. Recognizing the importance that service work would take on for the average dealer, the organization commenced a year ago to expand its parts and service facilities. Today, parts stocks for all of the appliance brands handled by this firm are available in quantities greater than ever before, and constant efforts are being made to improve the situation.

The "then and now" pictures showing the almost complete transformation of a distributorship from electrical appliances into kindred equipment are the best evidence that this organization is almost "eating its cake and having it too," for the very customers who make it possible to carry on through the war period will be right there waiting for the first electrical appliances that will come rolling off the lines someday.

● NATIONAL BETTER LIGHT-BETTER SIGHT Bureau offers materials for continued publicity to the necessity for adequate lighting to preserve eyesight and contribute better seeing to the war effort. The series of booklets on home, factory, and store lighting are available. Advertisements and slide films, a talking movie picture in color, *Light Makes Sight;* animated window displays, counter and window cards and two educational booklets, one for teachers and one for laymen, are among the materials being offered through this national bureau.

Recruits from the Handicapped

How one appliance service company is solving today's number one problem—repair manpower

REPAIR MANPOWER? It is the No. 1 difficulty, according to most dealers. Yet a helpful suggestion for those perplexed by the labor shortage is offered in its solution by a large and prominent Los Angeles electrical appliance service company in the employment of physically handicapped persons.

The work these people are doing ranges from serving the public at the counter to the complicated mechanical jobs involved in appliance repairs.

About five months ago, the manager of this company grew tired of replacing men lost to the armed services or war industries with new men, and losing them in turn. Replacing them with women held the danger also of losing them to higher paid jobs. The idea of employing physically handicapped persons occurred to him. He conferred with the Los Angeles office of the United States Employment Service, where such persons are registered. Through U.S.E.S. facilities, he hired several people of this type, and they proved satisfactory. They were joined by others until today 45 of the company's 57 employees have impaired physical faculties.

A visit to the company's plant shows a hunch-backed girl waiting on the counter, standing on a box so that she can reach over it. A woman suffering from partial paralysis of the lower limbs also waits on customers. A girl who stutters so badly she could not continue her education works in the office. A man with an artificial hand works in the parts department. A man with one eye and one with limbs so paralyzed that he can stand only in one position are expert repairmen. They exemplify the 47 handicapped men and women employed by this company.

No claim is made that these persons can do the work in the same time as those with normal faculties. The manager estimates that his labor costs have increased by about 50%. He realizes that it is costing him more to get work done but, in his opinion, dollars and cents and profit enter but faintly into business in this emergency. He is satisfied if he meets costs and stays in business to render a greatly needed service to the user, dealer and manufacturer of electrical appliances . . . and maintains his business standing for the brighter days that will follow the war.

This plant is a cheerful place. These lame people have known the cruel position of being dependent. Today they are independent, and they work with a joy and a loyalty that is heart-warming to behold. Their jobs not only are a means of making a livelihood; they are the doors which have opened to them a normal, busy life. Therefore they love their jobs, and perform them with a devotion seldom encountered in the business world.

One day a superintendent of the plant found one of the women crying. In reply to his question, she sobbed that she had misplaced a part that was supposed to be enclosed in the box she was packing. She had been entrusted to do this job, she had failed, and she was disgraced. A search revealed the part concealed inside another, and the woman dried her tears and went on happily with her work.

Many of these people have shown surprising advances in their ability to do better jobs. One girl suffering from paralysis was hired to unpack packages mailed to the company from users or dealers, and place them with information enclosed or a letter regarding them, ready for work in the plant. One day an appliance arrived without a name or anything to identify the sender. The girl was alert enough to note the postmark, which later led to its identification when a letter arrived inquiring why the repaired appliance had not been returned. Her initiative earned her a better job.

An advantage is the ability of these people to keep working despite minor illnesses. Fighting pain and discomfort is an old story to them, so ills of a minor nature that would keep many normal persons at home do not bother them.

An unexpected result has come in customers' reactions to being served by physically handicapped persons. Regular customers who, after giving only a vague description of the part wanted, lost their temper when the wrong one was brought to them, now take pains to give complete information, and they wait patiently instead of impatiently. In many cases, they ask permission to go behind the counter and help find it.

Much of the success of this company's new labor plan is due to its manager. He is a friendly, cordial man who calls all his people by their first names, and is greeted by them in the same way. He is interested in each person's accomplishments and is generous in his praise of a job well done. When he comes around, faces light up and eyes shine.

Meet the New Regulations

CMP to replace PRP, conduit prohibited, motors to be loaded, radio parts released, retailing defrilled

RATIONING isn't new to business. Its critical materials have been under a rationing system since before the war. But food rationing made the headlines at year's end and Americans began to prepare themselves to take it, too, in stride. Food, America's most abundant commodity, had become critical, had become a weapon in a starving world.

Developments in the priorities and price control situation during the past month included: announcement of the Controlled Materials Plan to take the place gradually of the limitation order and priorities system; talk of a War Savings Bond plan whereby bonds purchased could be earmarked for future purchase of a new refrigerator, range, kitchen or automobile, and thus sold by dealers of these commodities; an order to streamline merchandising by eliminating many of its extra services and frills. Metal conduit will be much curtailed in manufacture and use, some range wiring restrictions have been relaxed, electric motors must be used up to their rated horsepower, radio repair parts were permitted to be manufactured.

Charles E. Wilson, who resigned as president of General Electric Co. to become WPB production vice-chairman, was given scheduling of production for the Army and Navy, one of the nation's most critical assignments. At the same time Ferdinand Eberstadt was given charge of the Controlled Materials Plan, which will go into effect by April 1.

Controlled Materials Plan

This plan is designed to time the flow of materials to better advantage so that certain parts will not be overproduced ahead of actual assembly needs. Its operation starts from bills of required materials submitted in advance by subcontractors and suppliers to prime manufacturers, cleared through the claimant agencies (Army, Navy, etc.) to coordinate them to war schedules. These result in requests for materials to WPB, which further adjusts these requirements to the total available supply of the three basic materials—steel, aluminum, copper—approves the program and directs it back either to the controlled materials branch or the claimant agency of its origin. In either case it results in allotments of the critical materials to the manufacturer and his subcontractors. Welcome news to subcontractors is that they are to fill out questionnaires only if specifically asked.

In fact WPB appointed James C. Woodson as "industry advocate" to examine questionnaire forms sent to industry, strip them of unnecessarily burdensome requests, consult with business concerns and act as their champion when questionnaires overload them.

Also of interest is that Joseph L. Weiner, former director of SEC's public utilities division, has been appointed director of the Office of Civilian Supply to replace Leon Henderson who resigned this as well as the OPA directorship. OCS serves as claimant agency for all civilian allocations of steel, aluminum and copper under the CMP. Utilities get their materials under this branch, with WPB's Power Division acting as their prime contractor, they as secondary contractors. OCS is also surveying consumer goods of all kinds to encourage simplification and standardization of consumer goods—to concentrate on the production of relatively few types of goods of standard quality, design and price.

Conduit—Ranges—Motors

An A-1j or better is now required before distributors can make sales or deliveries or contractors can install metal conduit, tubing or raceway. Flexible conduit may be installed for necessary extensions less than 12 ft. in length to connect motors, devices or control equipment. Restrictions of L-225, however, do not apply to conduit or tubing in the possession of an electrician Dec. 16, or which has been physically delivered or was in transit to the site on or before that date. Used conduit, etc., is also exempt.

Ranges in the possession of a user who moves to a new location can now be wired and the utility can connect to them under an amendment to P-46, provided the dwelling moved into is not equipped either with a range of any other kind or complete facilities for serving either a gas or electric range. A limit of 15 lb. of copper is set for making the connection.

Purchasers of electric motors must now show that the horsepower rating is no greater than that required to do the job under terms of L-221, effective Dec. 10. This ruling is made to conserve copper. It has been standard practice to over-motor many loads. The order also requires the applicant to certify that he has made every reasonable effort to adapt idle motors or generators in his possession, to obtain a used one or to repair or recondition existing equipment. Special types are not permitted used except where absolutely required for safety.

A new War Housing Manual, including the critical list and procedures for making applications as of Dec. 12, has been issued by the construction bureau of WPB. It simplifies the orders and requirements.

Services and Prices

Radio parts may now be supplied for home receiving sets. Persons buying such parts do not need ratings and distributors may replace stocks through use of the standard PD-1x distributors form.

Simple and easy to understand, just what has been badly needed in all the orders of the various agencies, is OPA Service Trades Bulletin No. 1, RTD-39, "Repair, maintenance and rental of radios, gas and electrical appliances" which can be obtained from regional and state offices. It tells in few and simple words how to price under the OPA service regulation 165.

On the construction MPR 251 it is likely, because of the volume of protests, that hearings will be held in Washington soon with representatives of trade associations in the construction industry to make such amendments as needed.

Recommended standards of retail practice and recommended wartime management policies to assist retailers to make the required curtailments in extra services without reducing ceiling prices will be issued by OPA. The retailers Economy of Victory Plan is designed to conserve both materials and manpower by eliminating such frills as sales on approval, returned merchandise, gift wrapping, lay-away and will-call privileges, free telephone calls, instruction classes, style shows, free concerts or refreshments, store decorations and even air conditioning.

It is an interesting sidelight that in Canada there is yet no price ceiling on services and repairs and that the opinions of the industry are only now being asked on the subject through trade associations.

Helpful note from RFC is that it is authorized to extend credit to dealers in any frozen or rationed article. This may be welcome news to dealers in electric ranges, refrigeration and air conditioning equipment. The nearest local office of Reconstruction Finance Corp. should be contacted by the dealer for information.

Utah Repair School

Schools and industry join to train new repair personnel

To replenish skilled appliance repairmen in the Utah area drained by local war plants and thus keep working the more than 600,000 electrical appliances sold during the past years, the educational course sponsored by the Electrical League of Utah swung into full production last month. Approximately 35 men and five women were enrolled in the first course held at West High School, Salt Lake City.

Preparatory to the course a survey of appliance repair shops conducted by the league indicated that a serious shortage of repair personnel existed, according to Leland B. Flint, president of the league. Local war plants had drawn heavily upon all available mechanics. Tremendous increases in population to man the war plants and military installations in the region had brought a greatly increased number of appliances into the area. Stocks of new appliances were almost completely sold out long before the year's end so that replacement of worn or damaged appliances will no longer be possible.

Cooperation of Salt Lake City schools was sought and eagerly given. Details of the course were worked out jointly by Ralph V. Bachman, director of adult education, Leland Flint, president of the Electrical League of Utah and J. F. McAllister, manager of residential sales, Utah Power & Light Co. and V. A. Winward, coordinator of trades and industries.

Subjects covered in the course include: Elementary electricity—theory of generation and distribution, wiring circuits and symbols; electric heating appliances—theory and shop work; motor appliances—theory and shop work; motor repairs—theory and shop work on split-phase, repulsion-induction, capacitor and polyphase motors; radio service—theory and shop work; refrigeration service—theory and shop work; trouble shooting; service shop management—estimating, serviceman's approach, tools and shop equipment, safe methods.

Instructors were drawn both from the school faculty and from the electrical industry. Dean Miller of General Electric Supply Corp., L. John Christensen, electrician, and H. J. Kroll of Utah Power & Light service department assist in the training in addition to R. V. Bachman, principal, H. B. Tanner, assistant principal and J. B. Hunter, of the faculty. Classes run from 7 to 10 p.m., five nights per week for eleven weeks.

Appliances used in the training are supplied by local wholesalers and dealers and the utility.

Flint declared that there were enough electric irons in the Salt Lake area to provide one for every home, that nearly 100% of the homes have radios and 75% vacuum cleaners and washers, and 90% refrigerators. It is to keep these going for the duration if possible that the service and repair shops must continue to function. Appliances release many thousands of women from hours of housework so that their efforts may be absorbed in the war effort too.

Make Them Last

Self-help booklets, pamphlets, and advertisements are being employed by almost all utilities to instruct their customers on maintaining home appliances. Two different techniques are employed by Utah Power & Light Co. and Portland General Electric Co.

Wartime Tips is the name given a 20-page booklet by Utah Power & Light Co. which is being "plugged" on radio spot announcements on eight radio stations and in newspaper ads. It is also being distributed by customer service contact men in the cities of Salt Lake City and Ogden. Response to it has been very favorable. The booklet starts with care of cords, oiling and then takes up the various appliances one at a time, giving hints for maintaining them to best advantage. It finishes with a page on protection of eyesight.

Portland General Electric Co. has issued a series of small 4-page folders to do the same job. These are sent out monthly with the bills. Each one deals with a separate subject. No. 1 told how to check and change fuses. No. 2 gave hints for the care of the electric range. The back page in each instance tells what a bargain electricity is compared to other products.

Training Books

For training of service personnel and for maintenance of electrical equipment the following books, pamphlets and manuals have been prepared for use of the industry. Name of the work and its sponsor are given in the following list:

Nash-Kelvinator Corp.:
- "Simplified Training Course for Refrigerator Service Men."
- "Instructor's Manual." (This is for use by the instructor giving the course referred to above.)
- "Trouble-Shooter's Guide for Refrigerator Service Men."

Westinghouse Electric & Mfg. Co.:
- Booklet—"The Care and Use of Electrical Appliances in the Home."
- "Service Operating Manual."
- "Service Round-Up Plan."
- "Service Man's Quick Check Guide for Appliances."

Miscellaneous:
- "A Guide to War Time Care of Electric Motors." (Allis-Chalmers Mfg. Co.)
- "Electrical Safety in War Time." (International Assn. of Electrical Inspectors.)
- "Proctor Launches All-Out Service Program". (Proctor Electric Co.)
- "Premier's Plan of Action for Appliance Dealers" (Premier Division, Electric Vacuum Cleaner Co.)
- "Utility Appliance, Maintenance and Repair Programs." (Appliance Maintenance Committee of Edison Electric Institute.)
- "How to Keep Your Farm Electrical Equipment Fit for the Duration." (Pacific Coast Electrical Assn.)
- "Electrical Home Maintenance." (National Adequate Wiring Bureau.)
- "Preventive Maintenance." (Anaconda Wire & Cable Co.)
- "Electrical Merchandising" carries each issue one or two pages of repair methods. Published by McGraw-Hill Co.
- November, 1942, issue of "Electrical Dealer." Published by Electrical Publications, Inc.

Repair class at Salt Lake City school

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McGRAW-HILL COMPANY OF CALIFORNIA
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Postwar Planning

THERE is about as much unanimity on the subject of postwar planning as there is on unified policy in the electrical industry. Seldom has a subject been fraught with more misconception, misunderstanding and misapprehension. There are those who say, "Win the war first, plan later." And there are those who see the wisdom of at least thinking about postwar conditions. Finally there is a group which expects a master plan which will solve all problems to be brought forth from some supreme agency.

Reduced to the least common denominator, postwar planning means that each individual and each organization in the industry should be thinking about the answer to this question: "What will I do if the war ends next week?" Or next month, or next year or three years from now? It's as simple as that. Every power company manager, every contractor, every dealer, every distributor and every manufacturer must have some conception of the steps he and his organization will take when peace comes. As a matter of fact there will have to be some alternative individual plans because business may face any extreme from a boom to a depression. Foreseeable contingencies must be weighed and plans laid accordingly.

Naturally some of this planning can be done cooperatively as regards the electrical industry. But fundamentally, it is an individual problem built around this certainty: When V-Day comes, there will be a domestic demand for consumer goods unprecedented in the nation's history. For x number of years, the public shall have had no automobiles, no refrigerators, no washing machines, tractors, tires, stoves, radios, heating equipment, typewriters, water heaters, and a list of other items a yard long. There will have been no building and virtually no improvements to dwellings and business property. There will be an accumulation of private building construction and public works, and a tremendous need for heavy machinery and small tools as factories return to the manufacture of peacetime products.

So each to his own planning lest he be left in the lurch.

1943—Year of Decision

NO realist can blandly face 1943 and declare with sincerity that it will be a happy year or a year of final victory. Wishes and optimism can so declare and give what cheer they may to those who need encouragement, but a constructive fact facing sees 1943 more as a year in the delicate balance between success which would speed victory and interminable war which would be tantamount to failure. It is therefore a year of decision.

Before 1943's advent America's participation in the war had swung from sparring around the ring to gain time to one of offensive action on all of the many fronts throughout the globe. As the President said, it was a turning point. It was a very hopeful and welcome turn to impatient Americans who do much better when carrying the fight to the enemy than when merely resisting. But it was by no means the beginning of the end. Even a crack-up of Germany and Italy would not mean the end of the much more difficult Japanese war.

Of more immediate concern, since most of us will have little to say of the war tactics, is the turn that our war effort will take in 1943. Donald Nelson declared some time ago that the construction of new facilities to produce would cease early in 1943 and that all materials available would be turned into the making of war materiel itself. It is this phase that is upon us now.

To the utilities it means strictly limited expansion and complete concentration upon maintenance and upkeep of existing facilities. To the manufacturers the swing has already been to conversion. Wholesalers probably will feel the cessation of new construction almost as seriously as the contractors. There should be an earnest investigation by both these branches of the industry into how better to fit into this maintenance and repair program to keep war industry rolling without interruption. Dealers will already have made their shift to other lines or to appliance service.

The tax load will be realized for the first time this year by many, and adjustments to that realization in the shape of wage demands and uneasiness are to be anticipated. The spending party is about over. This will not be easy for the "new rich" to take in some instances but it is something that must be faced. A war is not a boom—for long.

A much tougher America faces 1943. It will be a leaner and still harder and tougher America that sees it through. None of its tasks ahead are easy. But the one thing that is most encouraging in the face of such a year as 1943 is that America is not kidding itself. It realizes that there is tough going and has been putting itself in condition for it.

Growing Pains

TAKE a map of the West and spot almost any city in the thickly populated regions and chances are you will hit upon a community with growing pains. San Diego, Riverside, Glendale, Phoenix, Richmond, Vallejo, Medford, Portland, Vancouver, Seattle, Ogden—the story is the same: population gains that reach 100% or more since 1940; pay rolls, industrial indices, retail sales, bank clearings, electric power consumption —all showing astronomical gains.

Chief among the growing pains are the headaches that have accompanied the provision of normal services for these population increases. It has required superhuman efforts to make available housing, school facilities, fire and police protection, electric and gas service, sewers, water, telephones in these communities. Municipal authorities and the utility companies in such towns deserve the highest commendation.

But that is only half the story. In a bulletin which chronicles the trials and opportunities in "a wartime boom town in distress" Ogden describes other growing pains. "Ogden is struggling along on a quota of supplies and merchandise—in all lines," it says, "little more than adequate to meet the needs of a town of half the population. Ogden's position is indeed unique. Few cities in the country are in a comparable situation, for Ogden has a volume of wartime activities far out of proportion to its resources and size. . . . Manufacturers, jobbers, Federal authority—all can help—must help, if Ogden is to meet the critical wartime demands imposed upon her. Ogden must have more of everything—and have it soon."

The plight of cities like Ogden and the others presents both an opportunity and a challenge. The challenge is to the local interests to meet the emergency requirements forced upon them. By and large they are doing it. The opportunity is for national manufacturers to benefit from the new business being developed. In some instances they are missing the boat.

Paperwork Relief in Sight

REALIZATION seems to have percolated to Washington that too much paperwork is in itself a hindrance to the war effort. Hopeful signs of relief began to appear as the new year rounded the bend. The Federal Power Commission and Edison Electric Institute developed a faster standardized report form that can double in brass for the SEC and for state regulatory commissions. The War Production Board established an umpire to whom harrassed business men can appeal for relief from questionnaires. The OPA issued a simple form of guide sheet for the pricing of repairs to electrical appliances, so badly needed. It merely tells what to do, what not to do—without a New Guinea jungle of legal entanglements to wade through. These are but signs, of course, but they are hopeful ones. There is still an avalanche of such forms and regulations to clear off the tracks.

WE CANNOT let any consideration stand in the way of winning the war. Remember, we are fighting an enemy who does not for one second care what happens to his own business people, to his own industrialists, to his own labor, or indeed to any single right or privilege which any of his people may have been lucky enough to retain. He is out to win at any cost. We are going to beat him, but we can't do it without stripping for action, and we've still got a long way to go before the United States is really stripped for action. We've already done some drastic things to our economy. We have cut off the production of consumer durable goods, we have limited the use of basic raw materials only to the manufacture of absolutely essential articles, we have cut off all non-war construction, we have rationed some of the most essential commodities in our daily life. We have done these things and others like them, because we had to do them in order to win the war, and we shall undoubtedly to a good many more equally drastic things for the same reason. . . . But there is one thing I would like to emphasize. . . . We are doing these things because we have to do them to win the war, and for no other reason. We are not making changes just for the sake of changes. We are not, in any single one of these actions, using the war to cloak a move for social or economic reform. The sole motive for these actions which so profoundly affect our American economy is the desire to win the war.—Donald M. Nelson, chairman, War Production Board.

Utilization for Pumping Loads

Utility can net dividends, help farmers increase production by engineering irrigation equipment

*E. G. Stahl**
San Joaquin Power Division, PG and E

UTILIZATION engineering for large agricultural customers can pay big dividends to both utility and customer. California agriculture depends upon electric power to a greater extent than any other state in the Union. Ninety-five per cent of all farms in the non-mountainous section of the state use central station power.

With a controlled water supply, a large part of which is pumped with electric power, the California farmer is able to produce an average annual income of approximately $6,300 per year compared to an average of $1,900 per farm per year for the remainder of the nation. Electric power is largely responsible for that high income, and wherever the farmer has been able to show a profitable operation through the use of electric power he has been quick to see and take advantage of it.

For about twenty years the California Committee on the Relation of Electricity to Agriculture, supported by the electrical industry, farm agencies, and the University of California (most of the time under the able direction of Prof. H. B. Walker) has conducted research activities and studied economies of operation of electric farm equipment. These studies have contributed much toward this great farm use of electricity in California. Coupled with this work, the utilities have trained crews of competent farm power advisors who have taken the information to the farmer, studied his problems, and assisted him in making profitable use of his electrical equipment.

Experience of this latter group has revealed that engineering customer equipment is just as important to the utility as engineering the facilities to serve. Illustrative is the work in Pacific Gas and Electric Co.'s San Joaquin Power Division on electric pump utilization. Pumping accounts for approximately 85% of the total electric farm power use in California.

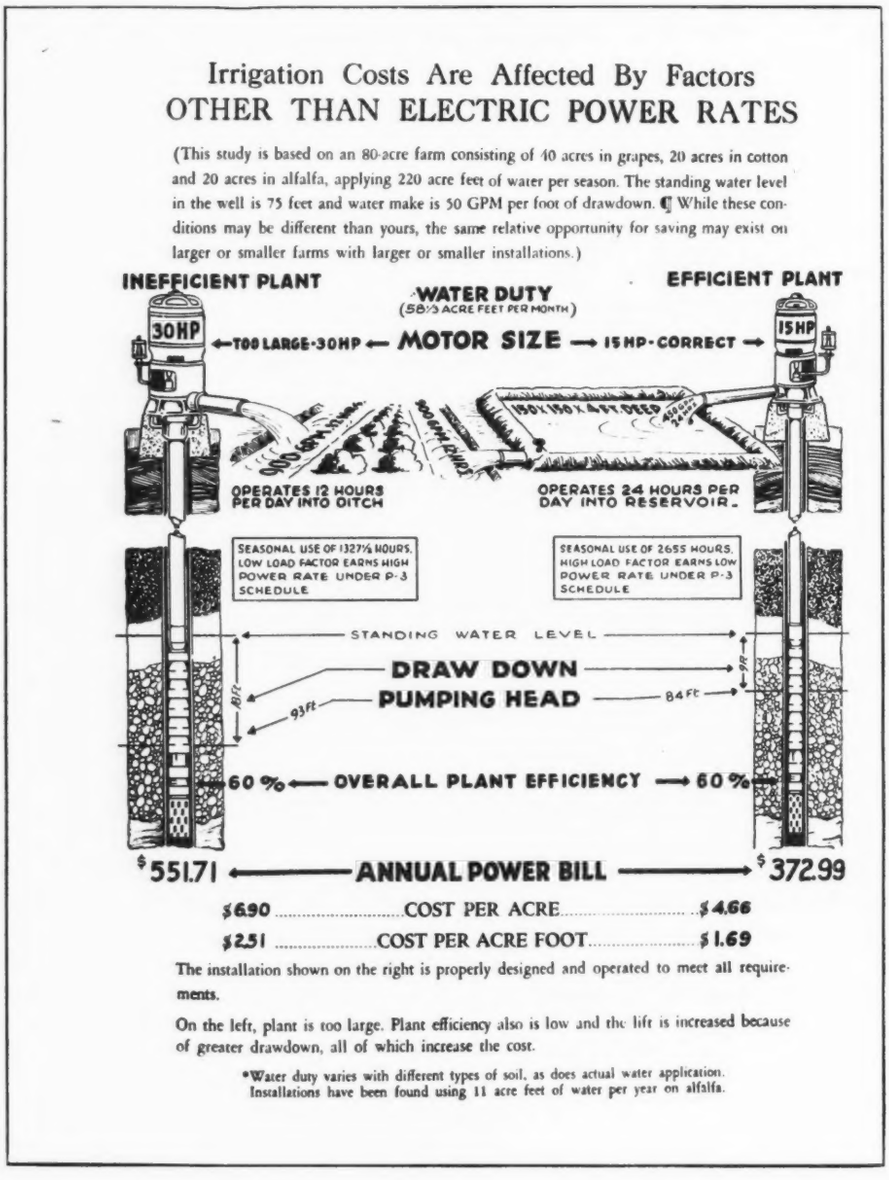
Irrigation pumping in the San Joaquin Division may be divided into two general classes: low lift pumping where the pumping heads run up to about 100 ft. and high lift pumping with pumping heads from 100 to more than 400 ft.

The low lift territory generally lies on the eastern side of the valley. The pumping plants are small and in many cases are used solely to supplement ditch water. The season of operation is short, ranging from one to three months of the year, and the problem of efficiency is of lesser importance than in the high lift territory where larger plants are used. The tendency in the low lift territory has been to install plants of larger size than was necessary to meet the farmer's requirements.

Fig. 1 shows the effects of efficiency and load factor on irrigation pumping costs. A 15-hp. plant operating 24 hours per day will pump more water than a 30-hp. plant operating 12 hours per day. With the smaller plant the farmer's investment cost is less; the power company's cost to serve is less; the farmer's cost for power will be less; and, strange as it may seem, even with a small power bill the net profit to the company will be greater. This is due to the lower demand which is reflected clear back through the generating facilities.

PG and E farm power advisors are trained to determine from the type of soil and the crops to be planted the maximum water requirements for each month, and the smallest plant to meet these requirements is recommended. The plant is purchased under a guaranteed efficiency performance and when in-

Fig. 1—Chart showing effects of efficiency and load factor on farm pumping costs


Irrigation Costs Are Affected By Factors
OTHER THAN ELECTRIC POWER RATES
(This study is based on an 80-acre farm consisting of 40 acres in grapes, 20 acres in cotton and 20 acres in alfalfa, applying 220 acre feet of water per season. The standing water level in the well is 75 feet and water make is 50 GPM per foot of drawdown. ¶ While these conditions may be different than yours, the same relative opportunity for saving may exist on larger or smaller farms with larger or smaller installations.)
INEFFICIENT PLANT
WATER DUTY
(58⅓ ACRE FEET PER MONTH)
EFFICIENT PLANT
30HP
←TOO LARGE-30HP ← MOTOR SIZE → 15HP-CORRECT →
15HP
150'X150'X4 FT. DEEP
OPERATES 12 HOURS PER DAY INTO DITCH
OPERATES 24 HOURS PER DAY INTO RESERVOIR.
SEASONAL USE OF 1327⅓ HOURS. LOW LOAD FACTOR EARNS HIGH POWER RATE UNDER P-3 SCHEDULE
SEASONAL USE OF 2655 HOURS. HIGH LOAD FACTOR EARNS LOW POWER RATE UNDER P-3 SCHEDULE
STANDING WATER LEVEL
DRAW DOWN
PUMPING HEAD
93Ft
84Ft
60 % ← OVERALL PLANT EFFICIENCY → 60 %
$551.71 ← ANNUAL POWER BILL → $372.99
$6.90 COST PER ACRE $4.68
$2.51 COST PER ACRE FOOT $1.69
The installation shown on the right is properly designed and operated to meet all requirements.
On the left, plant is too large. Plant efficiency also is low and the lift is increased because of greater drawdown, all of which increase the cost.
*Water duty varies with different types of soil, as does actual water application. Installations have been found using 11 acre feet of water per year on alfalfa.

* Condensed from an address before the Pacific Coast Electrical Association at Fresno, Oct. 22.

stalled is tested by power company pump testing crews before the farmer makes the final payment. Thus correct size of installation and efficient operating performance are guaranteed. These pumping installations in gravity water territory are very important to the farmer. They supply water when water is most needed. They supply that extra quantity of water necessary for full production and profitable operation. They tend to counteract high ground water levels, a danger confronted by nearly all gravity irrigation systems. The division maintains an accurate up to the minute record of ground water levels showing danger spots when water levels rise, and providing valuable information when new wells are planned.

On the western side of the valley in the high lift territory conditions are different. Here farming operations are built around the pumping plant. The cost of water is the major item of expense; the pumping plant investment in many cases is nearly equal to that of the land. A 1,500-ft. well with a 125-hp. motor set at a 300-ft. lift will cost upwards of $15,000. Such a plant on grain and cotton farming will handle about a section of land. Therefore, in this territory farms are large, ranging from 640 acres to as much as 50,000 acres per farm; and electric power costs for pumping run from $3,000 to $200,000 per farm per year. The power cost is an important item of expense, second only to labor costs, and amounts to from 7% to 10% of the farmer's gross income. The farmer gives much thought to this expense, and there is usually an engine salesman lurking in the vicinity to tell him how much cheaper the job can be done with an internal explosion engine.

Under these conditions the annual one billion kilowatt-hour irrigation pumping load in California did not just come on the line like some of our war load. It was pioneered years ago by such men as A. G. Wishon, who borrowed the money from the bank to finance the first electric pumping installations, and then stuck on the job day and night to make them work. Since that time equipment has been improved; pump and motor manufacturing comlations, and then stuck on the job day rates have gone down; better methods of water distribution have been worked out; and information on underground water conditions have been collected and charted for the entire division.

As a result there has been developed on the west side of the San Joaquin Valley, extending from Los Banos on the north to the Tehachapi Mountains on the south, one of the greatest farm producing sections of the entire world.

Because this remarkable development could not have been possible without

PACIFIC GAS AND ELECTRIC COMPANY
SAN JOAQUIN POWER DIVISION

AGRICULTURAL ENGINEERING SERVICE

(New—[illegible])

Name John Doe District Los Banos Date June 15th 1942

Legal Description NE¼ SW¼ Sec. 8 T 15 S.R. 14 E. Trans. Loc. 2730

Type of Soil Sandy Loam Service Order No. Zone No. 6 Zone Hrs. 5000

CROP AND WATER REQUIREMENTS

		TOTAL ACRE FEET Peak Mo.	Annual
48 inch app. on 130 acres of Cotton	=	130	520
18 inch app. on 250 acres of Flax	=		375
18 inch app. on 260 acres of Barley	=		390
inch app. on acres of	=		
inch app. on acres of	=		
inch app. on acres of	=		
Peak Mo. & Annual A.F. required	=	130	1285
Gravity Water Supply A.F. less %	=	None	None
Net A.F. of pumped water required	=	130	1285
Additional for seepage and evaporation 15 %	=	20	193
Total A.F. of pumped water required	=	150	1478

Pk A.F. 150 x5431=G.P.M. 1191
Peak Mo. Hrs. 720 Req'd.

Ann. A.F. 1478 x5431=Annual G.P.M. 1200 Hrs. Use 6689

I.H.U.= 1689 7643 L.F

PUMPING PLANT DATA. (Obtained from Field Records). Reservoir None

Make of Pump Type Turbine Total Head 257 G.P.M. 1200 G.P.M./Ft. D.D. 21

A.F./Day 5.33 Motor H.P. 100 H.P. Input 120 Kw. Input 895 Kw. Hr./A.F. 405 O.E.% 65

PREVIOUS TWELVE MONTHS OPERATION

Pumping Plant Service

Acct. No. Mtr. No. Rate P35 H.P. 100

MONTH	YEAR: Kw. Hr.	Amt.	YEAR: Kw. Hr.	Amt.	Hrs. Operated—Pk. Mo.	A.F. Pumped—Pk. Mo.
May						
Start→ June 8	2.6" Irrigations on Cotton takes 28 days					
July	2.6"	"	" " takes 28 days			
End→ Aug. 30	2.6"	"	" " takes 28 days			
Start→ Sept. 1	12" Pre-irrigation on Barley takes 56 days					
Oct.	"	"	" "			
Nov.	12" "	"	" Flax takes 54 days			
Dec.	"	"	" "			
Jan.	12" "	"	" Cotton takes 28 days			
Feb.	6" Irrigation on Barley takes 28 days					
End→ Mar. 13	6"	"	" Flax takes 28 days			
Apr.						
Totals		$	598,665	$4179.00		

Domestic Service

Acct. No. Rate Kw.

MONTH	YEAR: Kw. Hr.	Amt.
Jan.		
Feb.		
Mar.		
Apr.		
May		
June		
July		
Aug.		
Sept.		
Oct.		
Nov.		
Dec.		
Totals		$

A.F. pumped 1478 A.F./Ac. 2.3 Avg. cost/A.F. 2.83 Avg. cost/Ac. 6.53 Avg. cost Kw. Hr. .0069 Avg. cost/Hr. .62

Remarks:

"NOTE IRRIGATION SCHEDULE ABOVE"

Revenue Change: Increase $ Decrease $ Date pump test delivered

Contacted by: Salesmans Signature Approved by: District Mgrs Signature

Fig. 2—A form to help the farmer allot water supply for maximum crop production

water and because this water is pumped with electric power, the farm power advisor of the power company is a key man in this great development. This fact is recognized not only by the farmer but also by the pump dealer and the farm financing agencies. Let's take a typical case and see just what this individual has to do besides secure the application, the contract, the credit statement, the customer's priority approval, and arrange for building the line.

Let's assume a farmer comes into the community, secures a section of land, 640 acres; plans to install a pumping plant and grow cotton, flax, and barley —that is a typical new development. The farm power advisor consults his records, made from some 26,000 pump tests, and determines that in this location the well will probably have to be 1,500 ft. deep. He recommends a well driller who has had experience in this territory.

The well is drilled and a test pump is installed. By regulating the discharge valve the pump is operated at different rates of flow, 600 gpm, 900 gpm, 1,200 gpm, and 1,500 gpm. As the water delivery increases the pumping head also increases. By this method the water make of the well is determined and the farm power advisor can calculate the delivery and the lift at which it will be most economical to operate the pump.

This fact decided, the farmer is now ready to enter into a purchase agreement with the pump company with provisions guaranteeing delivery of a certain amount of water at a certain efficiency of operation. The pump is installed, the power company crew tests the pump, any necessary changes are made to meet the guarantee, and the farmer is now assured of a definite

Load Factor, Unit Costs, Annual Revenue
Agricultural Pumping Customers

Customer No. 1—3775 Hp.						
Agricultural Season 1930-31	1932-33	1934-35	1936-37	1938-39	1940-41	1941-42
Load Factor 30.4%	44.6%	41.9%	50.2%	49.4%	48.9%	51.0%
Cost Per Acre Foot						
Per Foot Lift..... $.021	$.017	$.014	$.013	$.012	$.012	$.010
Annual Revenue $45,324	$47,724	$55,124	$70,333	$75,493	$98,825	$111,945
Customer No. 2—1730 Hp.						
Agricultural Season 1935-36	1936-37	1937-38	1938-39	1939-40	1940-41	1941-42
Load Factor 49.3%	58.8%	60.5%	80.6%	72.0%	64.0%	63.4%
Cost Per Acre Foot						
Per Foot Lift..... $.017	$.013	$.013	$.0125	$.0121	$.0119	$.0120
Annual Revenue $38,133	$40,918	$49,025	$58,555	$64,776	$58,702	$59,809
Customer No. 3—5851 Hp.						
Agricultural Season 1931-32	1933-34	1935-36	1937-38	1939-40	1940-41	1941-42
Load Factor 65.3%	72.7%	77.6%	91.1%	85.1%	71.9%	70.0%
Cost Per Acre Foot						
Per Foot Lift..... $.0183	$.0172	$.0110	$.0105	$.0122	$.0113	$.0104
Annual Revenue $43,600	$47,400	$97,506	$189,188	$203,193	$208,977	$212,339

supply of water, say 1,200 gpm at a definite operating cost.

But the farm power advisor has not finished yet. He must assist the farmer in allotting his water supply to the various crops which are to be grown. He must know his crops and he must know his lands.

Fig. 2 is a form used for working out this problem and submitting the information to the farmer. The objective, which is in the best interest of both the farmer and the company, is to secure maximum production by keeping the pumping plant operating day and night for ten or eleven months of the year. This pumping plant represents a large investment, the cost of power to operate it is a major item of expense, and it therefore must be efficiently used; otherwise the farmer will soon be out of business and the power company will have an uncollectable bill and an idle investment on its hands.

After the pumping plant is in operation it must be maintained at reasonable operating efficiency. Wear on rotating parts and changes in the ground water levels affect both the water delivery and the efficiency of operation. PG and E pump testing crews are available to test plants and submit reports on water delivery and efficiency, and to make recommendations for improvements. It has been found that, to get the full benefit from these reports, they must be carefully explained to the customer by farm power advisors. Under certain conditions comparative reports may be submitted, showing present cost and expected costs when certain recommended improvements are made. Operators who have a number of pumping plants keep records of different plants by months, for which the utility supplies the information.

In general farming, operations are not fixed as in fruit farming. Crops are changed from year to year depending upon conditions and each change presents a new problem of water distribution. Most large operators have all of their plants tested each year and call in the farm power advisor for consultation on crop water allocations. This has given an excellent opportunity to help plan the work so as to increase the annual hours of use of the pumping plants—an extremely important item to both the power company and the farmer. If the use of a 100-hp. pumping plant, for example, can be increased from 3,000 hours operation per year to 6,000 hours operation per year, the amount of irrigation water pumped is increased 100%. The cost to the farmer for power is increased only 47%, but the net profit to the company is more than doubled, and the result is approximately equivalent to connecting another 100 hp. plant on to the line.

To provide an incentive for this load factor improvement work, PG and E has established quotas for increased hours of use of existing pumping plants and has given credit against those quotas for accomplishments. The accompanying tables show some of the results. These are the more spectacular achievements, but this work extends down to the smallest operating units.

From this brief summary of the duties of a farm power advisor, it is obvious that he must be something more than just an order taker. His work has been essential to this great agricultural development. It is more important now than ever before in order to help farmers produce at a maximum rate. This production depends upon a constant supply of water. If, through failure to maintain pumping equipment properly, water delivery is reduced, crop production will be reduced in direct proportion. A seven-day forced shut down for repairs on a 1,200-gal. pump in the busy season may, for example, reduce the production of wheat by as much as 750 bushels. And 750 bushels of wheat converted into flour will make 48,900 one-pound loaves of bread, or converted into butadiene will make enough rubber for 214 six hundred by sixteen automobile tires.

Twenty years ago when maximum pumping heads had reached 100 ft., it was generally believed that the economic limit of water lift for general farming had been reached. But, as previously pointed out, equipment has been greatly improved, power rates have been reduced, and better utilization methods have been employed. For the past few years flax, barley, and cotton have been produced at a profit with pumping heads up to 400 ft.—thus making many thousands of acres of formerly arid land available for agricultural development.

There is still much good undeveloped farm land on the western side of the valley. The war has slowed down new development work, but after the war is over there will be a great demand for this type of farming land because of its many advantages. The power company has asked its farm power advisors, during the course of their regular work and without adding to their car mileage, to make a survey of all undeveloped farm land within specified boundaries. They will mark on a map the area and designate the good farming land. In the division office the type of soil and the water levels will be inserted. From this information prospective purchasers can be directed to the type of land to meet their farm requirements, and the utility can estimate in advance the potential load and plan location of lines and substations to supply it.

Right now the important job is to win the war. Some of us who are not in the armed services can make our greatest contribution to this objective by helping the farmer produce.

Meetings Held in Northwest

Utilization and accounting divisions exchange ideas on wartime operation at round tables

COMPLEXITIES of wartime operation were thrashed out by Northwest utility men at round-table conferences of utilization and accounting divisions in late November and December. These two meetings and a third scheduled in January for engineers and operating men were sponsored by the Northwest Electric Light & Power Assn. which has streamlined its operations to fit the present emergency.

Utilization Section

The Utilization Section conference (J. C. Plankinton, Northwestern Electric Co., chairman) held in Portland, Nov. 20-21, was attended by 35 key men representing ten utility companies, with a smattering of jobbers and manufacturers. These former salesmen explored avenues of approach to the problem of rendering customer service in the face of WPB restrictions and gas rationing.

Discussion centered around these topics: what can be done by and for dealers; securing sub-contracts for small manufacturers and shops; power factor correction as a conservation measure; the operation of the Northwest power pool; what can advertising do; and just what is the function of a utilization department anyway.

The number of sales people in residential and farm sales departments in nine companies has been reduced from 237 to 90 within the year. Only three companies are doing some merchandising, but many former appliance salesmen are transferred to other departments to retain good men in utility service. Farm electrification men have changed their occupations to farm service men and are assisting farmers to get what equipment is available, even to the point of converting electric milking machines to gasoline driven for the duration. This type of work was pointed to as being excellent good will work. Home service girls are conducting group meetings, instead of calling at individual customers' homes; teaching Red Cross Canteen; conducting courses in nutrition; and teaching former maid-hiring housewives how to cook, since the domestic servant is now practically extinct in the region. Many of the new residents of the fast-growing war industry centers in the Northwest never saw an electric range.

Commercial and industrial men are finding more than enough to do as consulting engineers, inspecting equipment, adapting off-standard equipment to the types of service rendered in the area, laying out plant arrangement and designing wiring, advising on purchasing and priority problems of plant managers, acting as liaison between the customer and the WPB; and, in the dim-out zone along the coast, helping customers to comply with army dimout regulations and still keep production up and merchandise lighted in windows. It was brought out that this group had been particularly effective in the plant surveys that have been conducted in every production center, in assisting small shops to get war contracts and thus stay in business in their communities. Noted, however, was a certain amount of movement of men and production tools from the interior to the coast where shipbuilding, airplane building and other large war work is largely concentrated.

Casualties among dealers have been about 50% to date and are expected to be much greater by early 1943. Small appliance servicing is still being pretty well cared for by dealers in the larger centers, and is expected to remain so indefinitely. Some manufacturers are trying to work out a plan to establish one good servicing center in each medium sized community, but the warning was thrown out that the utility would probably have to assume this function in small towns if the appliances were to be kept in service. All service shops are hampered by the shortage of nichrome wire, and a plea was entered that the WPB recognize the importance of appliance servicing to the war and allot to service shops the small amount of nichrome that would be necessary for the normal run of replacement and repairs.

Utilities are still doing most of the servicing of ranges. This plus the "lights out" type of service call is presenting a critical problem, however. Gas rationing, with its allotment for necessary work is expected to alleviate this to some extent—at least it will permit the company to schedule definite mileage for this function, and a more closely controlled zoning of service calls. Advertising and direct mail broadsides have been used by some companies in an educational campaign on the replacement of fuses. The time delay type of fuse was recommended as being a means of cutting down service calls.

Extension of service to new customers is under absolute control of WPB now so economic considerations are not a factor, but the problem of saying "No" to applicants has not become much easier. Special cases are brought before a committee in some companies as a means of arriving at absolute fairness in decision and to take the sting off the "no" if no is the answer. Care is taken not to throw onus on the WPB as such, but to explain properly the critical nature of the copper problem. Temporary service is rendered by the companies universally charging the customer the up and down cost, plus a rental of from 1 to 2% per month of the value of the equipment tied up. Some companies kick back a portion of the up and down cost if the power bill figures to better than one-third ratio.

How far can advertising take the place of direct customer contact and what should be advertised, was a subject of considerable discussion. Fred W. Holtz, Reddy Kilowatt, New York, urged the use of the monthly bill as a medium for a message, the placing of sign messages in the now vacant appliance stores, and the adoption of a flexible type of copy in newspaper advertising that could treat of current day affairs quite closely. "Bring out the war work being done by the company," he urged.

J. Harvey Leach, Puget Sound Power & Light Co., stated he had found that most of the criticism of the company stemmed not from rates or economic considerations but from personalities. He cautioned executives not to expect to correct all misunderstandings by running an ad.

The group generally did not favor a public discussion of a possible power curtailment before curtailment was ordered, nor any discussion in advance of a possible future power shortage. (No shortage now exists and none is expected in the near future.) John Dierdorff, Pacific Power & Light Co., commended the copy in the national advertising of the utility companies, which is telling the story of "power plenty" from a national standpoint, whereas it would be dangerous for any company to talk about plenty of power locally. One caution was voiced: Do not brag too much about the essential nature of the power industry in wartime, because of a possible political kick-back.

How a critical situation with respect to power supply in the region during the long dry summer and fall was alleviated by the operation of the new power pool in the five Northwest states was told by R. R. Robley, Portland General Electric Co., member of the operating committee. All power generated by public and private agencies alike is now thrown into the interconnected network and is transferred between companies by a scheduling

program arranged between individual companies in advance. This operation has conserved fuel, cut losses, stored kilowatt hours in the form of water, handled sharp increases in load, filled breaches caused by breakdowns, and otherwise performed heretofore impossible benefits for all private, municipal and federal plants now being taxed to the limit to keep ahead of the new wartime demands.

Opinion was somewhat divided as to whose responsibility it was to correct power factor, though all agreed that adequate correction was a conservation measure. Consensus was, also, that you cannot readily get the customer to correct his plant power factor without having an enforceable penalty for low power factor in the rate.

Accounting Section

Customer accounting and collections, pay roll, stoves, personnel, fixed capital and power pool accounting were the principal subjects under round-table discussion at a conference of chief accounting executives and other key men in the Accounting and Business Practice Section of the Association at Seattle Dec. 14-15. J. H. Clawson, Puget Sound Power & Light Co., was chairman.

Re-vamped meter reading procedures ranging all the way from reading all meters as usual both urban and rural, through quarterly reading in rural areas, to no readings at all except by customers on return post cards, were reviewed in the discussion of customers accounting practices, with E. W. Bredemeier, Portland General Electric Co., discussion leader. Bredemeier stated his company was still reading all meters. Several companies have gone to quarterly reading in rural territory with interim monthly bills estimated, but one company operating in California found the regulatory commission of that state unwilling to approve the practice. H. W. Millay told the group Pacific Power & Light Co. had gone all the way to customer reading by post card. The way was paved for this by a broadside sent to customers saying, "12 Postal Cards will save 600,000 miles of tires for Uncle Sam."

Collection policies have likewise been pretty generally revised in the light of gas rationing and tire conservation. Employment of collectors has been abandoned and policies have generally been stiffened, particularly with respect to cut-offs for non-payment. Opinion was divided as to the use of neighborhood pay stations, some companies finding them expensive, but there was general agreement that payment to the station on a transaction basis was preferable to a percentage basis.

Paul R. Enright, Eastern Oregon Light & Power Co., outlined the new "Victory Tax" law and suggested a method of applying the withholding deductions allowable. Some confusion exists in the interpretation of the wage stabilization measure, it was apparent. Whether a new, untrained employee could be started at lower than established ceiling wages for a certain job and advanced up to the ceiling was in doubt. Experience with women meter readers had not generally been satisfactory, it was pointed out in further discussion of personnel problems under Ralph W. Lawlor, Northwestern Electric Co., discussion leader.

Problems involved in establishing a minimum working inventory under P-46, and how to handle material ordered for special jobs outside P-46 were subjects for an exchange of experience in the discussion of material control under the leadership of T. W. Fryou, Portland General Electric Co. It was pointed out that WPB doesn't want to see the surplus above minimum working inventories used up too fast, but does want to see this exchanged between companies in emergencies.

Changes in accounting procedures necessary to set up costs of units of property for retirement purposes were explained in the discussion of capital accounts under R. W. Miller, Idaho Power Co., discussion leader. Some companies have installed a system of completion reports on job orders to include all costs in detail, with car mileage shown and reference numbers to the pay roll to get accurate labor charged. Also time studies of particular jobs are being conducted as a guide to labor costs in the past.

Charles C. Bonin, Ebasco Services, Inc., and a member of the group that coordinates the operation of the Northwest's new power pool, explained the method of accounting for energy transfers by a system of scheduling rather than by meter readings. With power flowing in all directions through four separate loops with Bonneville as the hub, meter readings mean nothing, he explained, but by a system of scheduling hour-by-hour deliveries and receipts between companies in advance, and billing on the basis of these schedules, the actual operating deviations tend to wash themselves out in time or else tend to reflect the most beneficial operating condition for each company. Many new problems of accounting for these transfers money-wise within the individual companies have been created, and the group agreed that uniform treatment of these accounting problems was desirable.

Industrial Application of the Dimout was the subject of a talk by T. W. Fitch, PGE illuminating engineer, at the Oregon Chapter IES on Dec. 8. Accompanying the talk was a display of lighting control devices and industrial units meeting dimout requirements.

Conference Called

To find out just how the various wartime restrictions affect the shop doing maintenance and repair of heavy electrical equipment, a special war conference on maintenance and repair is being called by the National Industrial Service Assn., Inc. at Netherlands Plaza Hotel, Cincinnati, Ohio, Feb. 17 and 18. according to Stewart N. Clarkson, executive secretary.

A business session the first morning, with the afternoon devoted to priorities and material procurement problems, the second morning will be given entirely to manpower (including womanpower) problems. The last session will be devoted to discussion of the new Motor Limitation Order L-221, the Certified Repair Plan, the accounting and tax service for motor repair shops and the effect of the war on shop practices.

Speakers from the WPB, probably including D. M. Crim, will explain the Controlled Materials Plan as it affects motor shops; J. M. Mullally, Copper Division and an official from the Manpower Commission will tell of the manning tables and replacement schedules. Training of new personnel, aptitude tests, and especially training of women for replacements will be considered. There are to be no exhibits, entertainment or other convention features. Held in the middle of the week when traveling is normally easier, nevertheless railroads recommend that tickets be purchased at least a month in advance.

● A PREVIEW of equipment which may find widespread acceptance to provide direct-current in small quantities was given the Electrical Maintenance Engineers' Assn. of Northern California at its Dec. 3 meeting. J. M. Dodds, application engineer, General Electric Co., first addressed the group, explaining with blackboard illustration the principles in mercury are rectification of alternating-current. Following his talk a tour was made to the Best Foods plant at 19th and Bryant Sts. where a 600-kw. rectifier installation was seen in operation. R. E. Kempf, engineer for Best Foods Co., conducted this part of the meeting.

Rectification of ac to supply dc requirements in office buildings and industrial plants, looking toward the elimination of purchased dc power after the war, made this a live topic and a large attendance resulted. It was a combination meeting for November and December. The next meeting, scheduled for Jan. 28, will be devoted to brazing and welding technique as applied to repair of resistance wire equipment. Walter C. Heston, of Samuel Gompers Trade School, will be in charge.

Electrical Wholesalers Meet

Magazine editor brings first hand information from Washington about trends in war pattern

GLIMPSES of things to come, of trends in the war pattern of the industry, brought directly from behind-the-scenes in Washington were given to two meetings of electrical wholesalers in Los Angeles and San Francisco by O. Fred Rost, editor and publisher of *Wholesalers Salesman* magazine, of New York, in the course of a new type of conference meeting of the Pacific Division, National Electrical Wholesalers Assn. The Los Angeles meeting, Dec. 8, attended by 45, was presided over by Fred Todt, General Electric Supply Corp., past chairman, in the absence of Dave A. Smith, Graham Reynolds Co., chairman of the Pacific Division. The San Francisco meeting, Dec. 10, attended by 35, was presided over by Harry Perl, State Electric Supply Co., Oakland, member of the NEWA executive committee from the Pacific Division. R. A. Balzari, secretary of the division, arranged the conference programs, which took the place of the former fall meeting of the association at Del Monte.

Rost at both the afternoon conference for wholesalers alone and at the dinner open to the industry at large presented his intimate views of what is being done in Washington and why, what wholesalers can do to aid in the war, and what is not being done but should be. The conference program also included general discussion of employment and employee problems, use of women in the industry, reorganization of jobs to adjust to the losses of manpower to the armed forces; and to planning, first to win the war, and to maintain the business of wholesaling so that it will be able to maintain the full employment of personnel after the war.

Editorial conferences at which groups of business and technical editors meet with government and business leaders in Washington and New York to discuss intimately the trends and adjustments brought by war conditions, Rost said, give a deep insight into future plans for the country. Without violating confidences of such conferences he said he could give previews of some of the trends to be expected in the next few months.

There will be more controls out of Washington, Rost declared, before there are any less, although efforts are being made to simplify much of the complex regulatory structure. He described Washington in wartime, discouraging any attempt to travel to it for any reason. He looked upon the very existence of the new tax law and its passage as assurance that a totalitarian regime is not being sought, for the wartime powers of the President were sufficient to decree confiscation rather than go through the democratic processes of a tax bill.

On renegotiation of contracts, too, he gave assurances that those in authority have no desire to remove incentive nor to destroy profit, but seek to have industry reduce costs itself rather than use the tax collector to reduce them. Normal expenses are to be allowed. There is no formula or yardstick on profits; each case is considered on its own merits and takes into account the postwar need of the company.

Uniform interpretation of rulings is a great human problem but training courses are being conducted by the war agencies to improve this, Rost said, and urged patience. Decentralization will help also, he felt.

Next step in control of materials will be that of attempting to redistribute existing stocks of frozen or surplus materials. This is a companion of the new controlled materials plan and will apply at first, as does the latter, to steel, copper and aluminum. There is not much danger of government warehousing, he felt, despite the socialist fringe insisting upon it.

The labor situation may shift from voluntary to compulsory allocation of manpower for the voluntary is not working equitably. Migration of manpower must be stopped to prevent disruption of entire cities and towns and overcrowding others. The tendency in the future will be to award less contracts to crowded areas and more to regions with labor available, moving the work to the labor rather than the reverse. Selective service for women is a matter of time, Rost said.

Better policy in respect to enlistment of key workers is coming, for in some instances vital industries were losing 3 to 4 workers to enlistment to one by the draft, and the disruption is serious. Dependency for deferment is on its way out also. Drains of younger men for a total military force of 9½ to 10 million men in 1943 will be heavy.

The distribution branch of the War Production Board, Rost said, is manned by people from the wholesale trades, which is a recognition that distributors are necessary. He urged that instructions for forms be followed very carefully to expedite answers, saying that nearly all difficulties and slowing of processing of orders could be traced to inadequate information or inaccuracies in forms which required back checking.

The African invasion, Rost said, illustrated America's ability in the handling of the details of distribution. Organized perfectly to bring together men and materiel from hundreds of places in perfect timing with secrecy that was amazing, the success of the campaign could be attributed largely to America's knowledge of distribution.

Laughingly he recounted one WPB official's definition of the wholesale business—"The only insane asylum in the world run by its inmates."

Of postwar potentialities Rost was very optimistic, saying that just the knowledge he had of developments in the research laboratories made him feel that no basic industry has a greater future after the war than the electrical industry, and no industry has less chance of an adverse reaction.

Asked if there might be "Victory models" of certain appliances made for general sale and distribution, Rost gave as his opinion that none would be forthcoming in 1943 except in limited quantities to outfit specific housing projects.

Small retail dealers who weather the war, Rost felt, will have earned the right because of superior managerial ability and will be strong factors in postwar selling. In good times or bad eight out of 10 who fail in business do so because of inability to manage. The survival of the fittest is working and those who survive will be fit to handle the postwar business, Rost declared.

Meetings

Ben Hill, Oakland lighting coordinator, led a discussion, *How the Electric Industry Can Help on the Dimout*, at the Dec. 14 meeting of the East Bay Electric Club. At the same meeting R. B. Pahlmeyer, B. F. Goodrich Co., spoke on rubber. On Dec. 7, the club saw Aluminum Co. of America's technicolor film, *Unfinished Rainbows*, the story of aluminum.

Dr. Joseph Slepian, Westinghouse associate director of research laboratories, was the main speaker at the San Francisco Section AIEE on Dec. 11. His subject was *Energy Flow in Electrical Systems.*

EMEA of Southern Calif. held its Annual Electrical Equipment Exposition, a table display of new developments, on Dec. 15. About 30 exhibits were shown.

San Diego Electric Club has given up weekly luncheons; is meeting every other Tuesday noon.

George H. Watson, formerly Pacific Coast manager for Manning Bowman, and now with the California State OPA, was guest speaker at a recent meeting of the San Francisco Pot & Kettle Club. His subject was *OPA and You.*

More Data Promised

More application data has been promised by the Illuminating Engineering Society as an outgrowth of discussions at the recent national convention, according to Fred Wellhouse, regional vice-president of IES for the Far West. The program is an outgrowth of requests from the Southern California Section's educational committee which requested literature and data not branded by commercial companies for use in educational work. The program is designed to extend the knowledge of illumination practice and engineering, part of the purpose of the organization, beyond its own members to contractors, maintenance engineers, architects and the general public.

Dr. Leland Brown, of Stanford University, has been appointed on the national executive committee from the Western Region H.

Wellhouse spoke both to the Southern California and San Francisco Bay Chapters upon his return from the convention, describing the outstanding papers and discussions at the meeting. He touched upon the contribution lighting is making to war production, conservation of critical materials by transfer of existing equipment not in use to other plants, alternate materials used in manufacture of reflectors, reduction in the variety of lamp bulbs, use of contrasting paint and colors to derive the utmost from lighting, a paper by Professor Higbee upon reflection factors and maximum utilization of light, use of fluorescent materials on outdoor signs to increase visibility even under sunlight, studies on the fatigue of fluorescent lamps, and war workers killed by reason of poor lighting on the streets and highways.

Perplexities Discussed

Substitutions and shortages as well as the widening gap of divergence between the National Electrical Code as it is being amended in the emergency and the static Safety Orders of the Industrial Accident Commission of California were among the perplexities discussed at the Nov. 18 meeting of the Southern California Chapter, International Assn. of Electrical Inspectors, at San Bernardino, home city of Chairman C. H. Herkelrath.

Discussing inspectors' problems, the question of permitting paralleling of small conductor wires when larger sizes are not available brought up the question whether once a substitution is permitted during the war, the inspector can legally require it changed later on. Further complications are that contractors making the installation may be out of business and the place of installation itself may have changed ownership.

Variance between the Code and the Safety Orders came up when members of the Industrial Accident Commission were asked whether they would permit installation of multi-motored machines which did not have individual starting protection for each motor on the machine. George Kimball, electrical engineer of the commission said that the legal department of the commission was considering this and other similar problems.

Wasteful use of Type S cord to wire temporary buildings when this cable is so urgently needed for portable tools and machines was discussed. Inspectors were urged to require buildings to be wired with other types rather than permit large quantities of Type S cord to be run exposed as a quick expedient.

W. J. Tretheway, of Huntington Park, was elected chairman and H. G. Ufer re-elected secretary-treasurer of the chapter for the new year. Depending upon conditions, the new year will see meetings centralized in Los Angeles; the first is due Jan. 27.

RMEL Managers Meet

The Rocky Mountain Electrical League held a special meeting of managers in Denver, Nov. 23, as a "tune-up" for the regularly-scheduled annual conference of executive personnel about Jan. 15-16, 1943. Pivotal discussion concerned WPB's Order P-46 and recent amendment which forbids purchase of new equipment from manufacturers unless proof is shown that such material cannot be bought from other utilities.

A Technical Committee, headed by M. M. (Tweedy) Koch and Guy W. Thomas, was formed when it appeared that priorities would be speeded if mechanical (Koch) and power (Thomas) experts furnished clearance on types of equipment needed and functions for which they are intended. More members will be added to adequately service this phase of league activities in 1943. RMEL's inventory of surplus stocks in possession of all member companies provides an excellent pool on which electric utilities in the region may draw supplies under purchase, loan or lease agreements. The new committee will analyze requirements of concerns requisitioning machinery or materials, and determine whether "pool" stocks will be adequate, or whether a priority on factory reserves should be asked.

C. C. Baker, chairman of the RMEL Utilities Division presided at the November meeting and raised the question as to whether extra charges should be levied (for warehousing, handling, etc.) over and above prices at which "pooled" surplus materials are listed. As a general policy, it was agreed that unless there is extra expense involved for crating, or otherwise preparing for shipment, no additional charge will be imposed.

It was emphasized that only those companies cooperating in the program by submitting lists of surplus materials to the clearing house, will enjoy full advantages of the pooling arrangement under WPB.

The November meeting was designed to clear the way for enunciation of the league's 1943 program at the January conference of RMEL utility managers. At that time Gaylord B. Buck, league president-elect, will formally take over leadership from J. W. Alexander, retiring president.

National Views Heard

Gathered from opinions expressed throughout the United States on his tour as president of the International Assn. of Electrical Inspectors were the views which William L. Gaffney, of Tacoma, reported to the Dec. 4 meeting of the Puget Sound Chapter at the Roosevelt Hotel in Seattle. Discussion of the Type S fuse has dominated the various meetings throughout the country. He gave a full account of the arguments for and against the Type S fuse which he had heard, together with comments of his own with respect to it. He also told of the approval of E. I. wire (emergency installation), saying that there had not been a report of government use of it for permanent installation.

The meeting was also attended by W. R. Volheye, new president of the Northwestern Section, and F. D. Weber, secretary-treasurer. Weber discussed arrangements for the next annual meeting of the section in Seattle with a view to organization of committees to handle the arrangements in advance. Messrs. Walker and Bost, of the Electric Club of Washington, renewed that organization's offer of assistance in the annual meeting arrangements.

The nominating committee recommended the re-election of the officers, R. J. Larrabee, Underwriters Laboratories, Inc., Seattle, chairman; T. M. Widrig, vice-chairman and C. S. Alger, Puget Sound Power & Light Co., Seattle, secretary-treasurer. They were unanimously returned to office.

● National Electrical Contractors Assn. has moved its headquarters from the Graybar Bldg. in New York City to 633 Investment Bldg. at 15th and K Sts. N.W., Washington, D. C. Increased need for closer contact with the various federal agencies with headquarters in Washington made this move desirable. Editorial offices of *Qualified Contractor* magazine will also be at this address, according to Laurence W. Davis, general manager.

PCEA Panorama — Edited by Mary Shoop

Repair School Open

Fundamental Training Given In Free Three-Week Course

PCEA's electrical appliance repair training school opened Jan. 4 at the Frank Wiggins Trade School in Los Angeles. Sessions are being held on Monday, Wednesday and Friday nights from 7 to 10 p.m. The free course will cover a three-week period.

Joint sponsors with PCEA are Los Angeles electrical dealers, the local office of the United States Employment Service and local school authorities. Because of the desire on the part of utility companies to see all possible aid rendered to dealers, the program also was aided in every way possible by H. C. Rice, Southern California Edison Co., L. R. Scofield, Los Angeles Bureau of Power and Light, and F. V. Frey of the Pasadena Light and Power Department.

Fundamental training was offered in the basic elements of electricity, repair of various appliances and the care and use of tools. Students were drawn mainly from three classes, all free from the demands of military service: physically handicapped persons, women and older men.

The supervising instructor, Howard Burdick, was furnished by the Los Angeles Board of Education. Each class, except the first, had a guest instructor especially qualified to present the subject under discussion. They were as follows:

Elementary electricity—Mr. Burdick.

Electrically heated appliances—Dick White, manager, General Electric Appliance Service Center.

Vacuum cleaners—W. N. Ferbrache, manager, service department, Leo J. Meyberg Co.

Washing machines — Wm. Vogel, owner, Electrical Appliance Service Corp.

Ironers—R. W. Cass, field service representative, Edison General Electric Appliance Co.

Motors service—J. O. Case, president, Quality Electric Co.

Radio service—E. E. French, service department, J. N. Ceazan Co.

Refrigeration service—B. F. Atherton, Nash-Kelvinator Sales Corp.

Service business and review—Elbert Kramer, Westinghouse Electric & Mfg. Co.

Electriquiz

1. What did Elihu Thomson, Charles F. Brush, Thomas A. Edison and James J. Wood have in common?
2. What American exposition was the gateway to the electrical era?
3. What type of filament was used in Edison's first successful lamp?
4. How many hours did this lamp burn?
5. What was the basis for the charge for use of the first electric lamps?
6. What relation did politics have to Edison's lighting the streets of Menlo Park for the first time?
7. How did Edison's invention of the incandescent lamp affect the stock market?

Answers are on page 78

Membership Drive

On their toes and getting results are members of PCEA's membership committee, headed by I. W. Borda, The Okonite Co., San Francisco, with S. W. Scarfe, General Electric Co., Los Angeles, as vice-chairman responsible for Southern California activities.

Six new company members have been brought into the PCEA fold, and the prospects for several additional ones are favorable. The drive for new personal memberships of employees of company members, although just getting underway, is showing excellent headway, indicating that in this field also this wide-awake committee will be successful.

Code Revisions

Another set of interim revisions of the National Electrical Code has been sent to California cities by PCEA. The continuous revisions of the code are noted and explained on standard size filing cards, and this service proves a most valuable one for a city electrical inspector. The newest set of revisions was contained on nine cards which listed and interpreted 16 amendments to the code.

San Rafael and Hawthorne are new additions to the California cities adopting the Uniform Electrical Code.

This brings the total of cities operating under the 1941 Edition of the code to sixteen. Because efforts toward civic adoption of the latest edition of the code are of relatively recent date, this acceptance of the code is encouraging, and indicates that it fits the needs of cities during war time.

● THE SUB-STANDARD electrical appli- sales ordinance which regulated, within cities adopting it, the sale of electrical appliances, permitting to be sold only those approved by recognized safety standards, is being revised by PCEA. Profiting by the experience of cities operating under the ordinance, the revisions make it more effective and enforcible.

Who Am I?

I was born in Terre Haute, Ind., Nov. 24, 1898. After completing high school there, I attended Indiana State College. My first job was in 1921 with a wholesale bakery organization as sales representative in southern Indiana and Illinois. I next entered the merchandising department of the Western United Gas and Electric Co. in Aurora, Ill. Who am I?

After a short period of selling activity with the utility, I was selected by the Standard Gas Equipment Corp. to organize and supervise their re-sale activities through the Good Housekeeping chain of appliance stores in Michigan, with headquarters in Detroit. I later continued the same activity in the Weiboldt chain of department stores in Chicago, and through the Laclede Gas Light Co. in St. Louis. From 1928 to 1932 I was with the Portland (Ore.) Gas & Coke Co. in the Electric Bond and Share Group as residential sales manager, and with Montana Power as general sales manager of the natural gas division. I joined Coast Counties Gas and Electric Co. in December, 1932, and was appointed district manager in 1935. Who am I?

I am chairman of the administrative services section of PCEA. I am a member of Santa Cruz Lodge B.P.O.E., and a past president of the Santa Cruz Kiwanis Club. My hobbies are baseball, football and basketball. I am married, have two sons, live in Santa Cruz, and my name is: see page 78.

NEWS of the industry

REPORT GIVES FIGURES ON POWER INTERCHANGE

Extent of power interchange among systems in the Pacific Northwest and the Bonneville-Grand Coulee system since the completion of additional interconnections in April 1942 is indicated in figures which have been released by the Bonneville Power Administration. For the period from April to December, 1942, the amounts were as follows:

Eugene municipal system to the Bonneville network, 9,262,000 kwh.; Centralia municipal system to the Bonneville network, 6,144,000 kwh.; Ellensburg municipal system to the Bonneville network, 387,000 kwh.; City Light of Seattle to the Bonneville network, 10,504,000 kwh.; Tacoma municipal system to the Bonneville network, 136,000 kwh.; Washington Water Power and Pacific Power & Light to the Bonneville system, 50,961,000 kwh.; Portland General Electric Company to the Bonneville network, 3,000 kwh.

Bonneville to Eugene, 1,376,000 kwh.; to City Light of Seattle, 90,368,000 kwh.; to Tacoma municipal system, 143,266,000 kwh.; to Washington Water Power company and Pacific Power & Light, 213,799,000 kwh.; to Portland General Electric company, 305,575,000 kwh.

Gross deliveries by interconnected systems to Bonneville system, 77,397,000 kwh. Gross deliveries by Bonneville to interconnected systems, 754,384,000 kwh. Bonneville's net deliveries, 676,987,000 kwh.

Utah Power & Light Files Refinancing Plan With SEC

Utah Power & Light Co. has filed a refinancing plan with the SEC in Philadelphia under the terms of which it proposes to acquire all of the properties and assets of the Utah Light & Traction Co. and the Western Colorado Power Co. and to dissolve those organizations.

Under the plan Utah P&L will issue $44,000,000 of new bonds, proceeds from the sale of which would be used to retire $44,176,000 of the power company and Utah Light and Traction. Utah P&L owns all of the outstanding capital stock of the traction company and Western Colorado Power and in addition owns all of the Western Colorado bonds.

In forming a single operating company, Utah P&L would assume all liabilities, forgive all indebtedness and dissolve both corporations. This would remove the company from the category of a holding organization.

Permission has been asked of the Federal Power Commission for a transfer of licenses covering certain power plants and transmission lines of the two subsidiary companies to Utah P&L in connection with the dissolution.

The refinancing plans do not involve any change in the present preferred stock of the company.

Cease Work Order Applies To Big Thompson Project

Prospects, late in December, were that the $50,000,000 Colorado-Big Thompson water diversion project will not be completed in 1943, as scheduled. Latest information—after two orders from Secretary Ickes to cease work had been countermanded for final reviews—indicated that only the Green Mountain Dam (a comparatively minor phase if no water is diverted for irrigation and power purposes) will continue construction work. Although the Alva Adams tunnel, to bring western slope water to the eastern side of the Continental Divide, is ten-thirteenth finished, the remaining three miles is to remain un-bored and expensive pumping machinery must be installed if the completed portion is to be saved, according to latest word from Washington. This operation would be more costly than holing the tunnel through, say experts, especially since all the critical materials necessary for completion are on hand or enroute to the project.

S. O. Harper, chief Reclamation Bureau engineer, made a hurried trip to Washington in an effort to save the enterprise. Colorado congressmen and senators, headed by the state's senior Senator Ed C. Johnson, carried their appeal to President Roosevelt.

● FOLLOWING a "below normal" month in October, stream flow in the Western states averaged 125% of normal during November, according to the water resources review published by the Department of the Interior. The range was from 54% of normal in Arizona to 380% in eastern Oregon. Stream flow in British Columbia, on the other hand, averaged less than during October, except on Vancouver Island, where there was a slight increase. Heavy rains were experienced in Oregon and Washington, with flood conditions in western Oregon. Precipitation in Arizona and New Mexico was 13 and 3% of normal respectively.

PG AND E PUTS NARROWS PLANT IN OPERATION

Power from the Upper Narrows plant on the Yuba River was flowing into the Pacific Gas and Electric system promptly on scheduled time Dec. 29. The new station has a capacity of 11,000 kva. and was completed in record time. It utilizes 230 ft. of head created by a U. S. government debris dam on the Yuba River.

Meanwhile work is progressing on the Pit No. 5 development on the Pit River with present indications that power from this source will be available before the end of 1943. The California State Railroad Commission has just issued the company a permit for this development, although the utility has contended that such permission was contained in a comprehensive grant issued 17 years ago to cover complete development of the Pit River for power purposes.

The new $21,000,000 Pit No. 5 plant will have a capacity of 146,000 kw. on peak. Approximately 15 miles of new 220-kv. line will be required to connect it with the present PG and E transmission network. In addition to this some $3,750,000 will be expended on additions to the Newark and Contra Costa substations to accommodate the new capacity.

Ruling Holds Utility Tax Not Part of Gross Revenues

According to a ruling of Assistant Attorney General Hugh A. Dressell at Olympia, Wash., the 2% utility tax, added to the bills of electrical energy consumers based on the scheduled rates of utility districts, is not a part of the district's gross revenues. He ruled that the tax is not derived from the sale of electrical energy.

The opinion was rendered for the division of municipal corporations, who said that Public Utility Districts No. 1 of Wahkiakum and Cowlitz Counties simply absorb the tax and make no attempt to collect it from consumers.

PUD No. 3 of Mason County adds a flat 2% to each customer's bill and PUD No. 1 of Grays Harbor County also adds 2% of the computed charges and collects it from the consumers.

● LONGVIEW, WASH., has been notified that the Washington Gas & Electric Co. has received court approval for sale of its system to the city. This leaves only the opening of bids and sale of bonds before the transaction is complete.

Tomorrow may be too late—do it NOW

WARTIME restrictions make copper products hard to get — this includes electrical wire and cable. It will pay you to protect what you have.

Anaconda's Preventive Maintenance Plan will help you check to see that cables in your plant are not being abused.

If you follow this free plan you not only help yourself, but more important, you help the war effort. This manual provides a practical automatic method for complete analysis of circuits and equipment... uncovers potential weaknesses ... methods for correcting them... with charts to enable quick periodic check-ups.

NOTE: Through this Preventive Maintenance Plan you may uncover the evidence necessary to obtain an "emergency repair priority." This is explained fully in the plan book.

43228

ANACONDA'S PREVENTIVE MAINTENANCE PLAN

ANACONDA

Anaconda Wire & Cable Company
25 Broadway, New York City

Please send copy of the Anaconda Preventive Maintenance Plan for safeguarding production.

Individual .....

Company .....

Address ..... City .....

1K

The Aviation Industry needs Seed Money

THIS Victory crop is sweet—10,000 planes per month next year seem certain . . . 5,000 per month already passed . . . Worldwide average of four enemy planes knocked down for every American plane lost . . . Jap average five to one . . . Still better planes coming off the line.

And beyond the war, some people see a vast new industrial field opening up for America:

▶ Giant freight and passenger airliners, flying the airocean to every part of the globe, linking our cities in a traffic network that will obliterate time.

Family planes that will jump golfers to far off greens.

What are the chances for this exciting post-war crop of commerce and convenient travel from our aviation industry?

We think the chances are rather slim, and we ask you to take a serious look at the reason.

In our proper anxiety to prevent inflation and control war profits, we have passed tax laws that are taking away most of the "seed money" that aviation companies will need when the time comes to go it on their own in the post-war world.

▶ "Seed money" is that part of profit which is held for re-investment in a business to insure its growth.

"Seed money" will pay for research on new and better products. It will pay for retooling when post-war models are produced. It will pay for the study of methods to get the lower costs that widen markets. It will pay for setting up new distributors and dealers, and for hundreds of other activities that are involved in the *growth* of a business.

▶ American industry has grown on "seed money." It has been a national characteristic to re-invest most of our profits in development.

A dangerous confusion between personal profit (salaries and dividends) and re-invested profit (which we have called "seed money") has found its way into our taxing system.

The tax law, and government contracts, should allow American Industry to accumulate funds for the numerous tasks of post-war development.

A sum greater than the total now remaining after taxes will be needed, if we are to take advantage of the new opportunities that will exist after the war.

It is probably the oldest law in economics that enough of each crop must be saved to provide seed for future crops.

Ask your Congressman to see that this economic law is not disregarded in an effort to take excess profits out of war.

Reprints of this advertisement are available in handy booklet form.

McGRAW-HILL PUBLISHING COMPANY, Inc.

330 WEST 42ND STREET • NEW YORK

Did you ever try to defend a PROFIT?

EVERY business man knows the difference between profit that is paid out to individuals and profit that is held for re-investment and future growth.

The trouble is that the public thinks of profit in terms of yachts, elaborate homes and costly debutante parties. They have learned to think that way because those things get the headlines.

The public does not know that far more profit money has gone back into American business than has ever been taken out for personal spending.

The McGraw-Hill Publishing Company is going to do its share in the job of explaining the difference between these two kinds of profit.

To be sure that the public does not confuse two different things that have always been called by the same name, we have developed the term "Seed Money."

"Seed Money" is explained in the McGraw-Hill newspaper advertisement reprinted on the opposite page. We urge you to read this advertisement carefully and apply its message.

There will be other McGraw-Hill advertisements on this vital industrial need. We hope, too, that other advertisers will adopt the term "Seed Money" and help by selling their employees in their own communities on the danger to living standards in taking away industry's ability to improve its plants and techniques.

★ ★ ★

THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION

23 publications, which gather "war-news" from the "war-production-front" through a staff of 153 editors and 725 engineer-correspondents... More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

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Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

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Engineering News-Record
Food Industries
Factory Management and Maintenance
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Power
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AFFILIATED WITH BUSINESS PUBLISHERS INTERNATIONAL CORPORATION, PUBLISHERS OF BUSINESS AND TECHNICAL MAGAZINES FOR LATIN AMERICA, AND OVERSEAS CIRCULATION.

WISH I HAD A
Thermador
AT HOME, TOO!

Heats in Winter
Cools in Summer

For many years, Thermador Fan Type Portable Electric Heaters have been providing comfort, convenience, and economy for American homes and plants.

Now they are essential in speeding up war production by improving industrial working conditions. Clean, compact, and safe, Thermador double-purpose units furnish warm air in winter—circulate cool air in summer. Flameless, fumeless. Thermator Heaters are available on priority orders in portable or built-in types for use on 115-volt A. C. service, 1650 watts capacity, or 230-volt A. C. in capacities up to 5000 watts.

Write today for Catalog B-12-2

ARMY E NAVY

THERMADOR
Electric APPLIANCES
THERMADOR ELECTRICAL MFG. CO.
5119 So. Riverside Drive, Los Angeles
Seven Leagues Ahead

GRANGE MAPS PLAN FOR POWER LEGISLATION

At a recent meeting in the Washington State Grange headquarters in Seattle, public power exponents from all parts of the state convened to map plans for securing passage of their proposed power legislation. Attending were officers of public utilities districts, representatives of Bonneville Power Administration, Seattle city officials, labor leaders of both AFL and CIO. Senator Homer T. Bone, principal speaker, declared that passage of Initiative No. 12, for which signatures are now being sought, would have an impressive effect on the public power thinking of the United States.

The initiative to be submitted to the 1943 legislature provides methods for the system-wide acquisition of private power facilities by district public power agencies. The measure would authorize two or more public utility districts to act jointly in acquiring private systems.

Referring to the opposition to the Bone bills when they were introduced in the Senate, Senator Bone declared, "If it had not been for the existence of vast power projects on the Columbia River and elsewhere in the Pacific Northwest our present war effort would not be nearly as effective as it is now."

In a pointed reference to previous criticism that the present Bone power bill in Congress would mean federal domination of power in the area, Bone said: "Don't ever get the idea that the federal government is going to walk over local public power operation. All that is being sought is to provide some machinery for assuring public control of our power."

At the combined meeting, committees were set up for every phase of operation, including financing. Securing the necessary 50,000 signatures before Dec. 31 was the first task undertaken by the group.

Northwest Clays Tested As Source of Alumina

Northwest clays may become a source of alumina for the growing aluminum industry in that area, if U. S. Bureau of Mines tests now underway at Boulder City, Nev., show them satisfactory for treatment by a new process.

This information was contained in a recent release from the Bonneville Power Administration, which has been cooperating in the attempt to develop a local source of aluminum oxide for Northwest aluminum plants by providing samples for the Boulder City pilot plant. Clay from beds near Castle Rock, Wash., and from the vicinity of Coeur d'Alene, Idaho, have been shipped by Bonneville to the bureau of mines plant.

A great saving in freight costs and improved operating efficiency would result to Northwest aluminum plants from use of these deposits. Present American aluminum production is heavily dependent for its alumina upon use of bauxite imported from Dutch Guiana in South America. Aluminum pig metal, such as that produced in the Northwest's new reduction plants, is made from the purified alumina which has been refined from bauxite at plants located in Illinois and Alabama.

PG and E Workers Vote on Union Representation

Collective bargaining agencies for outside workers in seven more Pacific Gas and Electric Co. divisions were decided in elections held between December 7 and 17, results of which were announced by the National Labor Relations Board in San Francisco. The CIO Utility Workers Organizing Committee was successful in three divisions and the AFL International Brotherhood of Electrical Workers in four.

Results for each division follow: San Francisco—CIO, 577, AFL, 238; Desabla—CIO, 35, AFL, 123; North Bay—CIO, 185, AFL, 116; San Jose—CIO, 292, AFL, 27; Stockton—CIO, 118, AFL, 305; Coast Valley—CIO, 4, AFL, 82; Colgate—CIO, 10, AFL, 120.

Two re-runs also were held because results in previous elections were inconclusive. In the Sacramento Division CIO had 198 votes, AFL 232 with 55 voting for no representative, leaving the issue still in doubt. The issue was still tied in the Emeryville shops. The count in elections held thus far stands 5 for the CIO and 8 for the AFL.

Only in the San Joaquin Power Division are workers represented by other than these two labor organizations. There all employees are represented by the Western Utility Employees' Union, an independent organization which has held exclusive bargaining contracts for 1,400 employees for many years. This group has waged a determined fight against efforts to have it declared outlawed under the Wagner act. Charges brought by the IBEW in the summer of 1941 were heard in a series of sessions which closed in December of that year. In May, 1942, a NLRB examiner found against the independent group. The Western Utility Employees' Union appealed, and arguments were presented before the Labor Board in Washington, D. C., on September 22, 1942. Since that no decision has been forthcoming, although the union has announced its intention of bringing the case before the Ninth Circuit Court of Appeals should it lose.

READY FOR ANY PRODUCTION CHANGE

from Peace to War . . . and Back

Today's accepted *best* in power and light distribution systems is parallel runs of BullDog BUStribution DUCT *for power*, and Universal Trol-E-Duct *for lighting*. Together, these systems take power and light right to individual machines . . . furnish ideal production conditions throughout your plant.

One machine or a battery can be put into operation the minute the roof of a new plant is on. Continued production is assured, without loss of time while waiting for power or adequate lighting, yet the whole production line including the BullDog equipment can be relocated or moved altogether in "jig time."

Pioneered by BullDog here in the home city of mass production . . . developed for mass production by mass production experts . . . BullDog Bus Duct Systems are engineered to save architects' time, contractors' time, executives' time, production time, maintenance time.

Plants which already have this BullDog equipment have found it expedites tremendously conversion to war products manufacture. Equally important . . . the change back to peace conditions will be just as quick with the completely flexible, 100% salvable, pre-fabricated BullDog equipment.

Use Your Local BullDog Engineer

His knowledge of and experience with these systems qualify him to cooperate with your architect or engineer in drawing up and submitting complete detailed layouts and specifications.

BullDog BUStribution DUCT takes power right to the production line, with individual protective plugs for each machine, while the Universal Trol-E-Duct provides completely flexible and adequate lighting . . . when and where needed.

BULLDOG
ELECTRIC PRODUCTS CO.
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YOUR Supplier CAN Furnish
PAINE
WOODSCREW
ANCHORS
ON LOW PRIORITY

Fig. 956—FIBER WOODSCREW ANCHOR available in 10 different diameters in Braided and Standard Types to fit woodscrews No. 5 to 1/2" lag in popular lengths.

Fig. 950—LEAD WOODSCREW ANCHOR available in 15 different sizes from 1/8" diameter by 1/2 length to 3/8 diameter by 2 length.

Fig. 950 Lead Type

Fig. 956 Fiber Type

Ask your Supplier TODAY and Write for Catalog

THE PAINE CO., 2983 Carroll Ave., Chicago
Pacific Coast Representative: PAUL ATCHISON
2711 So. San Pedro, Los Angeles, Calif.

PAINE FASTENING and HANGING DEVICES

ALL KINDS
of SMALL
TRANSFORMERS

—in the JEFFRIES line

Practically all your small transformer needs are supplied by the Complete Jeffries line. We have specialized for years in providing transformers to exactly match your requirements. If not in our regular line, we build to meet your specifications—in a hurry!!

Minimize your voltage losses. Specify scattered transformers to eliminate duplicate conduit runs, and save on power costs.

JEFFRIES TRANSFORMER COMPANY
1710 E. 57th St. Los Angeles, Calif.

COURT HEARS APPEAL IN SEC REGULATORY CASE

Hearings on a petition to determine whether Pacific Gas and Electric Co. is engaged in interstate commerce and thus is subject to regulation by the SEC, have been held before the Ninth Circuit Court of Appeals in San Francisco. The company was seeking relief from a prior court order that it was subject to federal regulation because in the opinion of the court and the SEC it qualified as a subsidiary of the North American Co.

The government has claimed that since 17% of PG and E stock is owned by North American, the California utility, under the holding company law, is a North American subsidiary. The company has contended that because it is independent and is doing business only in California, it is not subject to SEC jurisdiction, but only to regulations of the California State Railroad Commission.

Women Can Fill Sixty Jobs In Industry, Agency Holds

United States Employment Service has listed 60 occupations in the electric utility industry for which women are suitable workers, even though they are not normally employed therein. The bulletin is part of USES campaign to augment draft-riddled labor forces.

Classifications approved for women range from simple to highly specialized. Simple occupations include watchman, porter, chauffeur and clerk. Specialized occupations include cable puller and repairman, field-coil winder, power house oiler, generator operator, electrical engineer, electrical tester and office manager.

The 60 occupations are divided into four classes, including those with a normal training period of less than six months, those with training periods of two to six months, those with training periods of six months to a year and those requiring more than two years for training.

Government estimates show 13,000,000 women of working age who are neither employed nor burdened with children under 16 years of age. From this source will have to come virtually all of the replacements for and additions to the existing labor force. As the draft cuts deeper into classes of men heretofore automatically deferred, women will become more and more widely used as replacements because of the assurance that they will not be called for military service.

Job titles listed in the four classes established by USES follow:

Cable puller, cable repairman, cable solderer, chauffeur, electrician apprentice, electrician helper, field-coil winder, low pressure fireman, gateman, material clerk, motorcycle driver, office boy, painter helper, lead painter, porter, solderer, stock clerk, light truck driver, warehouse record and stock clerk, watchman, and welder helper, all of which are listed as jobs requiring less than two months training.

Cable splicer, fire extinguisher serviceman, grounds keeper, paymaster, power house oiler, pumpman stock control clerk, tool clerk, tubing tester and welder are listed as jobs requiring two to six months training.

Electrical and mechanical draftsman, maintenance painter and combination welder are listed as jobs requiring training of six months to a year.

Bench repairman, electrical engineer, electrical tester, chief electrician, electrician foreman, power house electrician, wiring and wire running electrician, generator operator, office manager, personnel manager, specification writer, stationary engineer, substation operator, surveyor, switchboard operator and leader weldman are occupations requiring two or more years training.

These titles, which vary from those in common use, are defined in the *Dictionary of Occupational Titles*, compiled by USES and on file in regional USES offices.

● GRAND COULEE DAM will have an installed capacity of nearly 700,000 kw. by December, 1943, the Bureau of Reclamation announced last month as parts for the fourth 108,000-kw generator began to arrive. The machine is expected to be in operation by July and a fifth unit is scheduled to go on the line in December, 1943. These five units with the two 75,000-kw. generators transferred from Shasta Dam, will give Coulee an output second only to that of Boulder Dam, officials report.

● FOR THE FIFTH TIME in nine years, the Eastern Oregon Light & Power Co. has been awarded the National Safety Council trophy for electric utilities for safe operations. The company had no lost time accidents for the year ending July, 1942. The trophy was accepted by President LeRoy Grettum of the company, who praised the work of Herbert Lentz, safety engineer, in setting up a satisfactory safety program.

● CONTRACT for more than 2,000,000 lb. of sheet steel for the Nisqually electric power project, under development by the city of Tacoma, has been let to the Columbia Steel Co., Seattle, for $82,000. Bids will be called soon for fabricating the steel.

● HEARINGS on rates of the Central Arizona Light & Power Co. opened in Phoenix on Dec. 15 before the Arizona Corporation Commission.

NOT HOW BIG THE MAN . . .

BUT HOW LARGE HIS SHADOW

WITH millions of dead and dying . . . the importance of the individual today would seem small indeed.

Still, maybe the way to measure a man is not by *who* he is, but by *what* he does.

That makes quite some difference.

Take the men and women now at work in the MILLER plant. Day and night they are turning out torpedo parts, bullet jacket metal, Navy wiring devices, gauges, special aircraft parts, searchlights, convoy lights, lenses, special castings, and a multitude of other war goods.

We like to believe the shadow of their usefulness looms large over the war world.

The work they are doing . . . essentially *precision* work with copper and brass and steel and aluminum . . . they do extraordinarily well. They do it by instinctive and developed skill, and by *tradition* . . . for MILLER has almost 100 years to its back in metalworking.

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DECISION AWAITED IN UTILITY RATE CASE

Rate hearings involving the Utah Power & Light Co. have been closed by the Utah Public Service Commission for study of the testimony introduced during sessions which began in November. Involved is a basic valuation study which the commission contends warrants rate reductions of upwards of $1,000,000.

During the course of the hearings several different valuation figures were introduced. An original cost study by the Utah commission staff set forth a figure of $64,000,000. The Federal Power Commission submitted a so-called prudent investment figure of $64.052.877. Utah Power & Light submitted a company analysis of reproduction cost which gave an undepreciated figure of $91,000.000. This, however, was ruled out of the record by the commission. The company also submitted an investment cost value of $95,000,000 based upon the variable value of the dollar, as contrasted with the original cost of $66.908.000 in 1912 when the company was organized.

Date of a possible decision by the commission is problematical.

● AT A RECENT special meeting, the Seattle city council passed an ordinance accepting a federal grant of $1,864,760 to apply on the project for increasing the height of Ross Dam on the Skagit River. Board of Public Works will call soon for bids on construction of the addition.

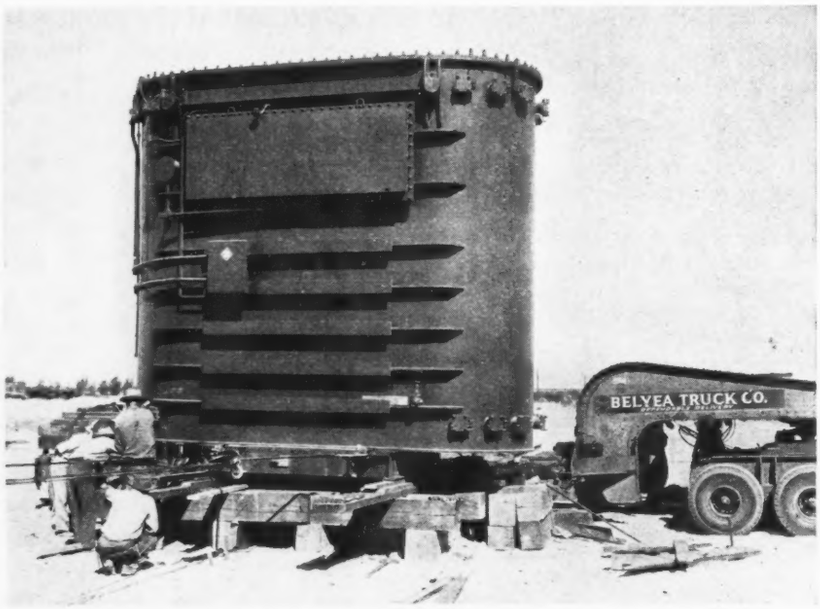
When bids were called before, only one firm bid on each of the several parts of the work, and the total cost was higher than the city could pay. This resulted in an appeal from the city for federal assistance. The government had originally asked the city to extend the dam to provide additional power for war industries.

New Hearing Asked in Property Valuation Case

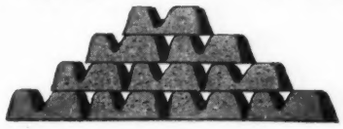
Both Pacific Gas and Electric Co. and the Sacramento Municipal Utility District have filed appeals for a rehearing with the California State Railroad Commission in the case setting a value upon the company's distribution system brought by the district. The commission had set a price of $10.600,000 plus severance damages of $1.032,000 on the portion of the PG and E system which the district is attempting to purchase.

If not granted by the commission, the petitions for a rehearing will place the matter in the hands of the courts.

● UMATILLA ELECTRIC COOPERATIVE ASSN., Hermiston, Ore., last month received a $20,000 REA grant. The allotment will be used to extend service to the Army ordnance depot in that area.



First unit of a 72-ton Allis-Chalmers transformer which is being installed at Imperial Irrigation District's Drop 4 hydro plant on the All American Canal, about 15 miles east of Calexico. The 15,000-kva unit will complete the connection between the district plant and the 161,000-volt transmission line from Blaisdell substation in Arizona, providing for distribution of power from Parker dam over the district's power system

When this much copper will carry the electric load and protect from corrosion--it is wasteful to use this much  for mechanical strength. Copperweld can use this much copper and this much steel---and <u>do the same job with a clear saving of 70% copper.</u>

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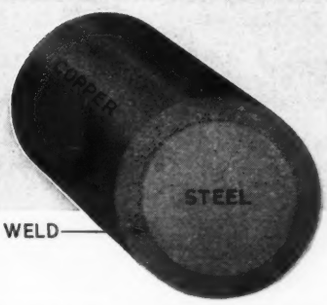

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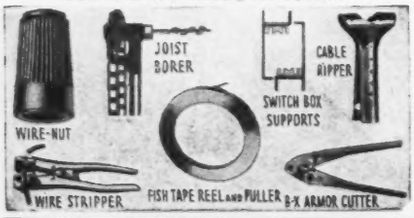

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ICKES ORDERS STUDIES OF POWER PROJECT

Twenty-four power and economic studies involving the Central Valley project in California have been ordered by Secretary of the Interior Ickes. Director of the undertaking will be Dr. Harlan H. Barrows, consultant to the USBR and former head of the department of geography at the University of Chicago. A field coordinator and staff will be located at the USBR headquarters in Sacramento.

The studies have been divided into three groups, including problems related to the prosecution of the war, those related to postwar readjustments and those inherent in the project since its inception. A list follows:

No. 1. What acreage now irrigated within the project area is suitable for the production of guayule rubber? How much of that acreage would be available for the purpose in 1943? in 1944? In 1945? What acreage now unirrigated would be suitable when project water can be delivered to it? How much of it would then be available for the purpose? Is the production of guayule rubber likely to be economically feasible on project lands after the war?

No.2. What areas could be served with irrigation water from project works in the immediate future, with a minimum of additional construction? What would be the requirements in money, labor, and materials for completion of the structures necessary to provide water for these areas? What contributions, by kinds and estimated annual amounts, could these areas make in foods, fibers, and seeds to help meet wartime needs?

No. 3. What war plants in or near the project area could advantageously use project power, and in what estimated amounts?

No. 4. What are the requirements for industrial water of war-production plants now located or likely to be located within reach of project canals already built or possible of early construction and that could be served advantageously, in whole or in part, from the project canals? Similarly, what contributions could be made to emergency requirements, present or prospective, for supplies of water in municipalities and military encampments?

No. 5. In what order should the remaining construction features of the project be accelerated if the project is to have maximum wartime utility in minimum time? In what order could the features be delayed or suspended with least impairment of the public interest?

No. 6. What reasonable possibilities may there be for conversion to peacetime uses, at the close of the war, of war-plant labor, structures, and equipments using project resources? How should these possibilities be promoted?

No.7. In what order may water storage and conveyance units, auxiliary to those of the Central Valley Project as now authorized best be constructed? What prospective need, if any, exists for additional developments to meet the exigencies of postwar readjustments of population? How shall areas for which irrigation water may be provided in connection with such increments be settled and developed?

No.8. What allocations of project costs should be made to power and to irrigation?

No. 9. What allocations of costs should be made respectively to navigation, flood control, salinity repulsion, and national security?

No. 10. What means exist or can be created for obtaining equitable payments toward the cost of the project from the beneficiaries of salinity control? What amounts should be paid by such beneficiaries?

No. 11. What amount should be assigned to the recreational facilities and opportunities that will be created by the project, as a contribution to its cost?

No. 12. What practicable means exist or what means can be established to secure equitable payments toward the cost of the project from business, industrial, and other enterprises benefited by it, and from property owners in the Central Valley who will be benefited indirectly by the project? What is the estimated aggregate amount of the payments that should be obtained by the means selected?

No. 13. What legislative measures are needed to make effective the allocations to non-reimbursable items?

No. 14. By what means, permissible under existing legislation or desirable under new legislation, may the distribution of project power by public agencies (assured priority of preference by Federal and State law) be encouraged?

No. 15. At what rates and on what terms shall project power be sold to different classes of purchasers for various types of use, including those of war-plant industries?

No. 16. At what prices should project water be sold for diferent uses—agricultural, industrial, municipal?

No. 17. To what type or types of agencies or organizations (individual irrigation districts, one or more "superdistricts," or counties) shall project water be sold?

No. 18. Shall the United States build or finance the water distribution systems, in whole or in part? If so, on what terms?

No. 19. What modification, if any, of the existing statutory limit to the size of land holdings that can receive water from irrigation works constructed by the Bureau of Reclamation should be recommended with respect to the Central Valley Project?

No. 20. What lands shall receive project water? At what rate, annually, shall new lands be brought under irrigation, and in what order?

No. 21. How may lands that will not receive a surface supply of project water but will be benefited through operation of the project, either by recharge of wells or by reduction of pumping lifts, be assessed equitably?

No. 22. How may the drilling of wells to irrigate more land from supplies of underground water furnished or augmented by the operation of the project works best be controlled and regulated in the public interest?

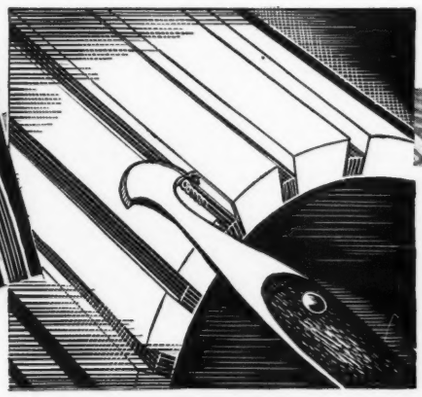
No. 23. How shall the recreational use of the reservoirs and shorelands above Shasta and Friant dams be promoted and regulated?

No. 24. What effect will the project have on agricultural economy and rural life in the Central Valley, especially apart from or in addition to those effects involved in previous problems? What effects on urban and industrial patterns and functions? Which prospective effects will tend to promote the public welfare? Which will tend to impair the public welfare? What practicable means might be adopted to strengthen beneficial tendencies and to weaken or eliminate harmful ones? How, in short, can the project be made to serve the best interests of the public in the Valley, the State as a whole, and the nation at large?

● BONNEVILLE POWER Administration has awarded to the Westinghouse Electric & Mfg. Co., Portland, on a bid of $60,030, contract for furnishing 15-kv. oil circuit breakers to be delivered at Mead.

The B A C of Good Commutation and Electrical Machine Performance

● Serious shutdowns and consequent delays in the production and delivery of urgently needed materials can be avoided by observing these simple precautions in the maintenance of motors, generators and converters. Under present conditions, dependable and uninterrupted performance of electrical power equipment is of utmost importance. Keep your machines in readiness to deliver full output at all times.



Keep Commutators and Rings Clean

Cleanliness is of paramount importance in the continuous operation of brush-using equipment. Time spent on keeping commutators, rings, brush holders and rigging free from dust, dirt, oil and film pays dividends. Use a suitable canvas wiper frequently on commutators and rings. Keep them clean and keep them running.

Keep Undercut Commutators Free from Side Mica

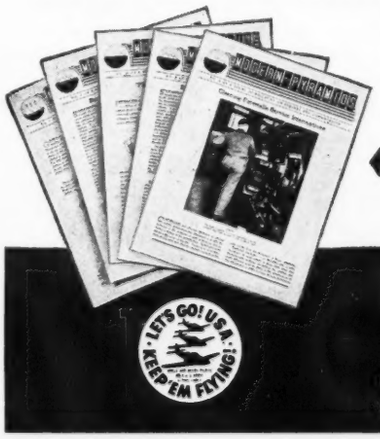
Thin edges of mica along the sides of slots of undercut commutators are a frequent source of trouble. Special care should be taken to inspect each slot carefully and to remove all side mica when undercutting commutators. Bad sparking and serious commutator burning can be avoided by observing this precaution.

Keep Brush Pressure Uniform and Correct

The spring pressure applied to brushes has a marked influence on brush performance. Equal distribution of current among all brushes requires that the pressure on all brushes be kept as nearly equal as possible. Check brush pressure frequently and adjust it to compensate for brush wear. Use pressures recommended for the grade of brush and class of service in which it is used.

MODERN PYRAMIDS will tell you more

This series of bulletins contains practical information on Commutation, Brush Operation and Machine Maintenance to help conserve present equipment and to keep it in continuous and efficient operation. If you are not receiving these bulletins write us direct or contact your National Carbon representative.



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PROCEDURE SIMPLIFIED ON FPC FORM NO. 1

A simplified procedure for preparing and filing copies of FPC Form No. 1 through use of die-stamped blank stencil sheets which, when filled out, can be run off on duplicating machines. has been worked out by the Federal Power Commission and the Edison Electric Institute.

The move is one of two cooperative ventures undertaken by the agency and the institute which the Bureau of the Budget characterizes as an "excellent example" of how trade groups and government units can work together to simplify government's data-collecting requirements upon industry.

FPC Form 1 is the annual report required from all Class A and Class B utilities under the Uniform System of Accounting provisions of the Federal Power Act. The form is about 140 pages long, covering data on all operating and financial activities of the companies. In addition to filing the required three copies with FPC each year, utilities file the same report with the Securities and Exchange Commission and state regulatory agencies, and usually require a number of copies for internal system use. Until now, most companies made a number of hand-typed "runs" of the report.

The original stencil dies for the new procedure, which will be available for the 1942 report due next year, are being made by the A. B. Dick Co. and are being proof read by FPC. Distribution plans are not complete but it is expected the blank stencils will be available through EEI. The stencil pages are reduced to the standard 8½ x 11 page size, and FPC will revise its rules to permit filing of mimeographed copies instead of the usual slightly larger forms.

The Budget Bureau, it is understood, is studying ways for extending the idea to other governmental reports which industry generally requires in some quantity for filing with other agencies or for company use.

The other joint undertaking of FPC and EEI involves coordination of FPC's Form 213 with a similar questionnaire collected by the institute. Form 213 is a monthly report covering sales of energy by classes of consumers and other operating data. A revised FPC form is being prepared incorporating data required by both agencies so that utilities can send duplicate copies to FPC and EEI.

● A 135-MILE transmission line from Grand Coulee Dam to Bonneville has been completed, permitting delivery of up to 150,000 kw. additional power to war plants in the area.

The coveted "T" flag is raised atop the Los Angeles Department of Water & Power headquarters by R. J. Patten, president of the employees association, Karl Avery, commander of the department American Legion post and Robert Blodgett, department employee on leave, wounded recently in action. The department is the first major utility to win the award, according to the Treasury Department. More than $124,000, exceeding 10% of pay roll goes for the purchase of bonds each month, with 98% of all employees enrolled in plan

Two Parker Dam Generators Put on Line In December

Two 30,000-kw. Parker Dam generators went into operation during December, with a third scheduled for commercial production this month and a fourth expected to be ready in May, according to an announcement by Secretary of the Interior Ickes.

Parker Dam power will be added to the southern California power pool and also will supplement present power resources in Arizona. The new plant is connected to the system of the Central Arizona Light & Power Co. by a 156-kv. line terminating at the company's Phoenix steam plant.

● HOUSING is a current major item in construction on the West Coast. New appropriations have been announced for 2,200 dwelling units in various Utah communities; $1,500,000 for 450 units in Hermiston, Ore.; $8,000,000 for 2,500 demountable dwellings for Seattle and $7,000,000 for 900 apartments and 1,750 single dwelling units in Port Arthur, Wash.

PRODUCTION OF ELECTRIC ENERGY SHOWS NEW GAIN

Production of electric energy in the United States was up 16% and installed capacity was up 5.9% in 1941 as compared with 1940, according to the Federal Power Commission report.

In 1941 2,762 privately owned plants produced 145,956,451,000 kwh. from a total installed capacity of 37,118,039 kw., and 1,308 publicly owned plants produced 22,213,529,000 kwh. from an installed capacity of 6,974,162 kw., according to the report. Of this total, 51,261,768,000 kwh. was from hydro, 115,276,508,000 kwh. from steam and 1,631,704,000 kwh. from internal combustion plants.

Pacific states with 310 plants listed and installed capacity of 4,534,982 kw. produced 17,904,960,000 kwh. in 1941. In 1940 311 plants in this area with installed capacity of 4,253,312 kw. produced 15,472,956,000 kwh.

For the Mountain states the 1941 record was 9,258,895,000 kwh. produced by 408 plants with installed capacity of 2,360,728 kw. In 1940, 405 plants in the Mountain states had a capacity of 2,217,379 kw. and produced 8,544,075,000 kwh.

● FENCING ELECTRICALLY, a 400-ft. 16-mm. silent movie film has been completed by The Prime Manufacturing Co. of Milwaukee, Wisconsin. This film, which is all in color, is a step by step story of the proper installation of an electric system and the proper use and care of that system. The information contained in it is particularly valuable during this wartime period of acute farm labor and material shortage. *Fencing Electrically* is available without charge to dealers, agricultural instructors, etc., for educational purposes.

● TACOMA, WASH., city council has approved a resolution setting aside $300,000 of Tacoma City Light Department funds for the second Nisqually power project. R. D. O'Neill, utilities commissioner, states the sum will be taken from current earnings. This will make a total of $600,000 applied to the project, cost of which went up with the rise of construction costs after the original $11,000,000 bond issue for the Nisqually development was authorized.

● AS A MEANS of relieving downtown traffic congestion and helping car owners save precious gas and rubber, Pacific Gas and Electric Co. has opened six additional pay stations in San Francisco. The new stations also will aid the family "treasurer" who formerly was faced with traffic and parking problems in the downtown area. Downtown collection offices will remain open for those who wish to use them.

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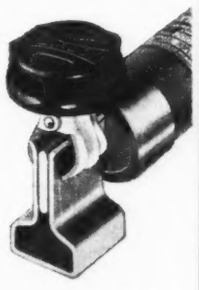

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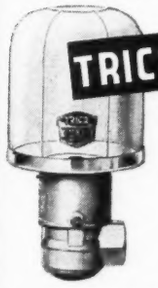

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Lamp Base Removers
Cartridge Fuse Tongs
Switch Hooks

Send for Catalogue
We have been making safety tools for 26 years

THE G. C. A. Manufacturing Co.
Pittsfield, Mass.

TORK CLOCKS

THE POPULAR TIME SWITCH LINE KNOWN EVERYWHERE

NOW—lower prices and higher capacities

There is a Tork Clock for every regular switching job; 60 minute, 4 hour or daily cycles.

Bulletins on request

THE TORK CLOCK CO., Inc.
MOUNT VERNON, N. Y.

Western Representatives:
A. R. Slimmon, 445 E. 3rd St., Los Angeles
Geo. H. Curtiss, 540 McAllister St., S. F.
H. M. Sayers, 1101 Eastlake Ave., Seattle
Stevens Sales Co., 41 P.O. Place, Salt Lake City
Felix Simon P. O. Box 614 . . . . . Denver
H. Geo. Shefler, P. O. Box 1587 . . . Phoenix

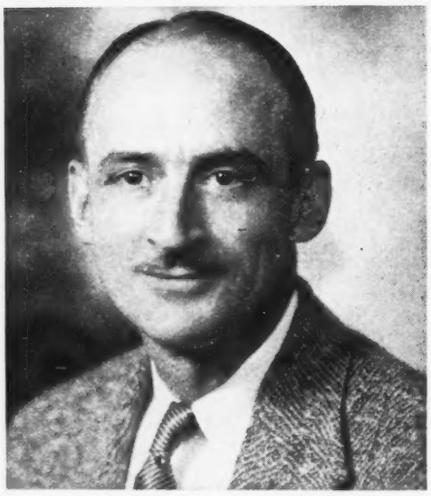
● Two 2,000-KW. mercury arc rectifiers which formerly furnished direct current for the San Francisco-Oakland Bay Bridge train service are being moved to Los Angeles as part of the expanding transportation system serving industries. Both main and inter-phase transformers are being rewound in the General Electric Los Angeles service shops because of the change in voltage and frequency.

● VICTORY CENTER, a non-governmental agency organized to aid in developing, uncovering and furthering undeveloped ideas which might expedite victory has been set up, privately financed, at 745 Fifth Ave., N. Y. Financing of workable projects is contemplated as well as assisting to exchange ideas submitted for improvement of public safety and efficiency.

CLASSIFIED

● COST of undisplayed classified ads is 5 cents a word, minimum $1.00 insertion. Box numbers in care of our San Francisco office count as 10 words additional in undisplayed ads. ● RATES per column inch of displayed ads is $3.85. ● All classified ads are payable in advance.

● ELECTRICAL ENGINEER available for administrative work or technical product application. Will locate in Los Angeles area or other Southern California point in thirty days. Address Box 52, Electrical West, 68 Post St., San Francisco, California.



Answer to "Who Am I?"
(See Page 63)
L. C. Rausch

Electriquiz Answers

1. They were all pioneers in the field of electric lighting.

2. The Centennial Exposition of 1876 at Philadelphia. The electric dynamo was one of the curiosities of the exposition. From that time, inventive minds kept prodding electricity into more tangible reality.

3. Carbonized cotton.

4. 20 hours.

5. A flat rate per week, regardless of current used, was charged for each lamp, since metering was unknown.

6. Edison's first installation of street lighting in Menlo Park was completed on Election Day, 1880. Interested in the fortunes of James A. Garfield, Edison resolved that if he were elected the circuit would be lighted. Garfield won, and the lights blazed forth to celebrate a political and electrical triumph.

7. Lighting prior to Edison's time was done by gas. His introduction of the first practical incandescent lamp caused dismay to the gas companies and threw the stock market into a turmoil.

● A 43% GAIN in hydroelectric power capacity and gains in water storage capacity were reported by the Bureau of Reclamation for the fiscal year from July 1, 1941 to June 30, 1942. Installations at USBR projects in the 11 Western states raised the total installed capacity in 28 electric plants to nearly 1½ million kilowatts. Storage dams were completed at Grand Coulee and Friant, both ranking among the world's largest concrete dams.

TRADE MARK REG. U.S. PAT. OFF.

Nichrome

***Made only by* DRIVER-HARRIS COMPANY**

Stocked for the Coast Trade at

SAN FRANCISCO
235-241 San Bruno Ave.

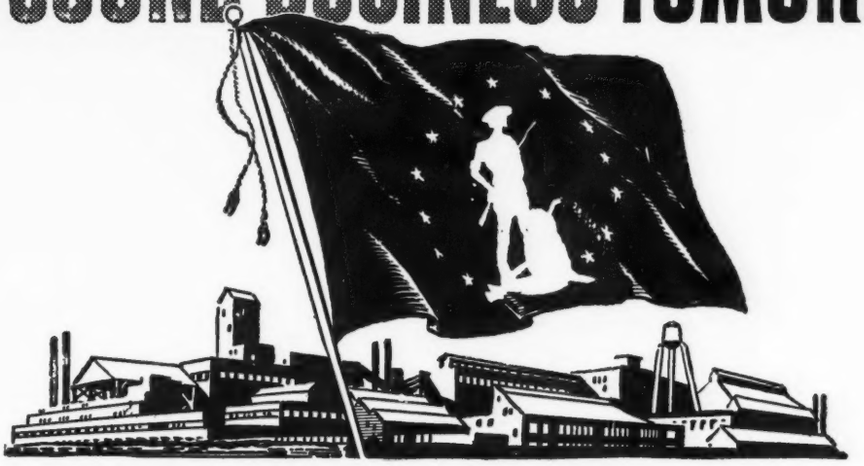
LOS ANGELES
449 South San Pedro St.

SEATTLE
2122 Fourth Ave.

By

ANGUS-CAMPBELL, INC.

FOR VICTORY TODAY AND SOUND BUSINESS TOMORROW



Get This Flag Flying Now!

This War Savings Flag which flies today over companies, large and small, all across the land means *business.* It means, first, that 10% of the company's gross pay roll is being invested in War Bonds by the workers voluntarily.

It also means that the employees of all these companies are doing their part for Victory . . . by helping to buy the guns, tanks, and planes that America and her allies *must* have to win.

It means that billions of dollars are being diverted from "bidding" for the constantly shrinking stock of goods available, thus putting a brake on inflation. And it means that billions of dollars will be held in readiness for post-war readjustment.

Think what 10% of the national income, saved in War Bonds now, month after month, can buy when the war ends!

For Victory today . . . and prosperity *tomorrow,* keep the War Bond Pay-roll Savings Plan rolling in *your* firm. Get that flag flying now! Your State War Savings Staff Administrator will gladly explain how you may do so.

If your firm has not already installed the Payroll Savings Plan, *now is the time to do so.* For full details, plus samples of result-getting literature and promotional helps, write or wire: War Savings Staff, Section F, Treasury Department, 709 Twelfth Street NW., Washington, D. C.

Save With

War Savings Bonds

This Space Is a Contribution to America's All-Out War Program by

ELECTRICAL WEST

ELECTROMASTER

DATA SHEET No. 2

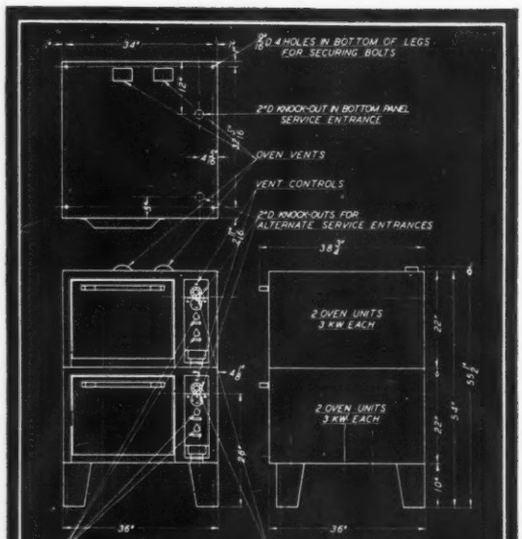
"Cadet"

A HEAVY DUTY ELECTRIC ROASTING OVEN BUILT FOR TODAY'S BIG JOB OF FEEDING THE MEN, AND THE MEN BEHIND THE MEN, BEHIND THE GUNS

The Electromaster "Cadet" Model HO-302R.

Whether on land or at sea, your electric cooking requirements are exactly satisfied by the complete Electromaster line. Ranges, ovens, and accessories are designed correctly and priced sensibly for prompt delivery.

Two great Detroit factories, experienced in straight-line production, are at your service. Compare—and choose Electromaster for the best in electric cooking.



ARMY E NAVY

ELECTROMASTER INC.

ELECTROMASTER INC.
1807 E. Atwater, Detroit

• Send me full details on the Electromaster line of heavy duty electric cooking equipment.

*NAME*_____

*ADDRESS*_____

*CITY*_____ *STATE*_____

PEOPLE
made this news

John Priestman Dies At Vancouver, B. C.

John Priestman, 61, died recently at his home at North Vancouver, B. C. Generally known as "Jack," Mr. Priestman was a prominent figure in the electrical field at Vancouver. He was born in Preston Brook, Lancashire, England, and went to British Columbia 53 years ago.

He was with the B. C. Electric Railway Co. for 46 years and held positions as supervisor of all outside sales crews, and later as merchandising supervisor.

He was transferred by the B. C. Electric to the Electrical Service League of British Columbia and there took charge of all field work, range promotional efforts and special displays, and acted as assistant secretary of the league. He was largely responsible for organization work in connection with the first big electric cooking schools held in Vancouver and other parts of British Columbia some years ago.

Mr. Priestman was also a past president and one of the founders of the Vancouver Electrical Service League, and was identified with the Vancouver Electric Club and other electrical bodies.

● JOHN WALSH, illuminating engineer for Pacific Gas and Electric Co., has been called to duty as a lieutenant, junior grade, in the United States Navy, after several months' special assignment of duty with the Office of Civilian Defense for the 9th Region, San Francisco, assisting Frank Hanson, illuminating engineer for the OCD. Walsh was headquarters illuminating engineer for PG and E in San Francisco after some year's successful activity in Bakersfield territory of the San Joaquin Power division. He was recently elected chairman of the San Francisco Bay Cities Section, Illuminating Engineering Society.

● BOYD W. WINTER has been appointed manager of Westinghouse Electric Elevator Co.'s Buffalo office. Winter has been application engineer in the Los Angeles office of the elevator company since 1936 and previously was manager of the Seattle office. For a number of years he was with the parent Westinghouse Electric & Mfg. Co. at Butte, Montana and Seattle.

● M. W. EDWARDS, electrical engineer for California Railroad Commission, is now a first lieutenant in the Corps of Engineers at Tucson, Ariz.

Harvey Edmund Advanced By Coast Counties

Harvey W. Edmund has been elected vice-president and general manager of Coast Counties Gas & Electric Co. and a member of the utility's board of directors.

Edmund had been sales manager for Coast Counties for nine years, and previous to that had been general sales manager for Standard Management and Operating Corp. which directs the affairs of Coast Counties.

A graduate in engineering from the University of Wisconsin, Edmund was associated for six years with Western United Gas and Electric Co., at Aurora, Ill.; spent two years in the Army Air Corps as a night bombing pilot in World War 1; and for a time was in the gas stove manufacturing business. He came to California in 1931 to work for Standard Management and Operating Corp.

Puget Sound Gives Seven Men New Responsibilities

Seven Puget Sound Power & Light Co. men were given new responsibilities in promotions announced by the company last month.

Jim Duncan was transferred from Lake City to Renton as manager. Bill Park succeeds him at Lake City.

Don King was named local manager at Bothell and Jim Swart was given a similar post at Burien. George Anderson is the new manager at the Kirkland-Bellevue offices.

Jim Fletcher has stepped into Park's former job as district utilization supervisor at Ballard and Joe Farrar succeeds Fletcher as utilization supervisor at Rainier.

● FRED I. WOLTZ, engineer with the E. A. Wilcox Co. at San Francisco, died in that city on Nov. 27. He was graduated from Pennsylvania State College in 1909 and during his career as an electrical engineer was associated with firms in New York, Pennsylvania and Missouri as well as in the West. For several years he was at Twin Falls, Idaho, with the Great Shoshone & Twin Falls Water Power Co., since absorbed by Idaho Power Co He became associated with E. A. Wilcox Co. four years ago. Joining the American Institute of Electrical Engineers as a student member in 1906, he maintained continuous membership until his death.

● J. F. AICHER, for many years in general headquarters staff of the sales department, Pacific Gas and Electric Co., San Francisco, resigned Jan. 1 to become affiliated with E. A. Wilcox, manufacturers' representative for industrial equipment and heavy-duty heating apparatus. Aicher, a University of California graduate, 1920, in mechanical engineering, was in Naval air service in World War I, has had a varied experience in industry and since 1924 has done industrial heating sales engineering for the utility.

Edmund

● R. S. BAXTER, deputy electrical inspector for Salt Lake City, last month was elected chairman of the Utah Chapter, International Association of Electrical Inspectors. At the same meeting D. J. Wolters, chief electrician for Salt Lake City, was named vice-chairman and N. S. Larson, Larson Electric Service, was re-elected secretary.

● T. C. CLARKE, British Columbia manager, Northern Electric Co., has been appointed to the board of directors of the Dominion Sound Equipments Ltd., which is associated with the Northern. He will continue in his present capacity as head of the Northern Electric in B.C. with headquarters at Vancouver.

● W. L. FROST, retired vice-president of the Southern California Edison Co., and HARRY L. HARPER, Pacific district manager, Graybar Electric Co., Los Angeles, have been appointed mediators for the War Labor Board in the Pacific Southwest. Both are representatives of industry.

● GUS STRIKER, recently appointed assistant to the general sales manager, Pacific Gas and Electric Co., left Dec. 11 to become a civilian fiscal control officer on a big Navy construction project in Oklahoma.

● W. C. HAMILTON, head of the Hamilton Electric, Port Alberni, B. C., has been re-elected by a large majority as mayor of that city.

Bay Groups Pick Leaders From Electric Industry

Chambers of commerce in the San Francisco Bay area have drawn upon men well known in the electrical industry for leadership in their recent annual elections.

Ernest Ingold, former distributor of radio and now Chevrolet dealer of prominence, was elected president of the San Francisco Chamber of Commerce. He also has been mayor of Hillsborough and president of the San Francisco Electrical Development League.

Berkeley Chamber of Commerce re-elected William H. Park, district manager of the Pacific Gas and Electric Co., for a second term as president.

In Oakland Eugene W. Garcia, manager of the Oakland house of General Electric Supply Corp., was named to the directorship of the Oakland Chamber of Commerce for a 3-yr. term. Louis J. Breuner, prominent furniture dealer and past president of the Electric Appliance Society of Northern California, was also named to the directorship.

● W. M. MOTT, president, Mott Electric Ltd., New Westminster, B. C., has been elected mayor of New Westminster. He succeeds Fred Hume, president of Hume & Rumble Ltd., electrical contractors, who decided not to stand again after many successive years in office.

Mott was born in Halifax and spent four years in the United States prior to going to New Westminster in 1928. He served overseas in the last war with the Signal Corps, R.C.E., and was elected alderman in 1936. He resigned his seat a year ago to contest Mayor Hume, and was defeated. This year he won over another opponent.

● FRED R. MAST of the Mast Electric & Radio Co. of Seattle has been promoted to Major in the Army. He is executive officer of the Troop Movement Section of the Port of Embarkation, Seattle.

● CARROL W. BRISSENDEN, Portland General Electric Co., has been commissioned lieutenant, j.g. in the Navy. He has been commercial heating engineer for the utility for six years.

● FRANK M. WARREN, Portland business man, has been elected a director of Portland General Electric Co. to replace the late L. C. Newlands.

● M. G. KENNEDY, of Pacific Power & Light Co.'s new business department, is in the Navy, taking officers' training.

● FRANK M. SULLIVAN, 74, a director of Puget Sound Power & Light Co., died in Seattle Nov. 15.

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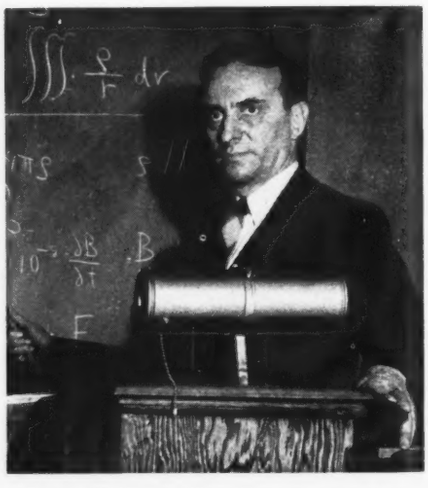
PROFILES *of the month*

Ralph J. Cordiner, Schick president, is director general for war production scheduling, a newly created WPB post. He is well known in the West, was formerly Hotpoint's Pacific Coast manager

Perry Demarest (left) Sylvania Pacific Coast manager, visits in the New York office of Charles G. Pyle. Formerly Sylvania sales manager, Pyle was last month named managing director of the National Electrical Wholesalers Assn.

Dr. Joseph Slepian, associate director of Westinghouse Research laboratories, visited the West last month. He is shown at right before a group of engineers



Below, no holiday for U. S. Engineers, North Bay Region, San Rafael, was Thanksgiving Day but women employees of the office prepared turkey dinner, which was served at their desks to this working group. Pictured, left to right: R. B. Hammond, T. E. Campbell, E. E. Chamberlain, chief clerk, Lt. Col. C. A. Tornelle, F. C. Rowley, and Capt. J. D. Smillie, executive assistant

on the *NIGHT SHIFT* in *YOUR HOME...*

EVERYBODY IS A STUDENT THESE DAYS!

You and your family are putting in extra hours of exacting eye work.

1. High school study is intensified.
2. College courses are shortened and intensified.
3. First Aid work requires constant refresher-study.
4. New duties and review keeps Air Raid Wardens busy.
5. Red Cross Nursing Courses require intensive study.

★

Keep eyes alert with ADEQUATE LIGHT!

Days do not end with sundown under the pressure of a nation at war. Time is valuable today. It must not be wasted. Night hours are full of added responsibilities.

You and your family must put in more time with household chores, sewing, mending clothes, knitting or dressmaking. Eyes are busy reading fine print, studying, making notes or writing letters to friends and relatives in the service.

Guard against eye strain during these busy night hours in your home. See that your home has adequate light for easier seeing and more cheerful surroundings. Check up the lighting in your home now before the long, darker days of winter begin.

P·G·and E·
PACIFIC GAS AND ELECTRIC COMPANY

BUY U. S. WAR BONDS REGULARLY AND OFTEN

WHAT...NO RABBITS?

The wave of a magician's wand and a murmur of "abacadabra" may produce wonders from an empty old hat. But it just won't produce copper wire and outlet boxes these days. To get our hands on them takes priority orders.

So it's up to all of us to make the most of what we have—to see that every foot of wire and every outlet installed counts most for now, and as much as possible for the future. For after all, this war is just an emergency job—a job to be done as thoroughly and as quickly as possible. Then back to normal again—back to doing the things we prefer and living the life we like.

We all know that right now we can't sell our customers everything they'd like to buy. But we want to do the best we can for them. Let's see that they get a full penny's worth of service for every penny they spend in electricity.

PACIFIC COAST ELECTRICAL ASSOCIATION

601 WEST 5TH STREET, LOS ANGELES • 447 SUTTER STREET, SAN FRANCISCO